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PART II.

General and Physical Chemistry.

Anisotropic Liquids. GEORGES FRIEDEL and F. GRANDJEAN (*Compt. rend.*, 1910, 151, 988—989. Compare *Abstr.*, 1910, ii, 809).—Polemical against Mauguin (*Compt. rend.*, 1910, 151, 886). The authors suggest that the term “liquid crystals” should be restricted to those fluids showing discontinuous vectorial properties, and not applied to substances, such as *p*-azoxyphenetole, which are, strictly speaking, merely anisotropic liquids. W. O. W.

The Ultra-violet Absorption of Oxygen. H. VON WARTENBERG (*Physikal. Zeitsch.*, 1910, 11, 1168—1172).—The adsorption of ultra-violet rays by oxygen, heated at temperatures varying from 1200° to 1800°, has been investigated. The oxygen was contained in an electrically heated iridium tube provided with quartz end-plates, and by means of a quartz-mercury lamp and a quartz prism, ultra-violet rays of wave-lengths $\lambda = 254, 239, 230, 220$, and $210 \mu\mu$ were separately examined. The photo-electric measuring apparatus consisted of a platinised quartz plate, contained in a highly exhausted tube, and connected with a Dolezalek electrometer and a Bronson resistance.

The observations show that the absorption increases as the wave-length diminishes, and for a given wave-length it increases with the temperature. This absorption is not due to the formation of ozone at

the high temperatures, but to an extension of the limit of the absorption region. In the case of oxygen at the ordinary temperature, the absorption limit lies at $186 \mu\mu$, but at 1800° it extends beyond $300 \mu\mu$.

H. M. D.

Absorption Spectra and the Constitution of Benzene Derivatives. II. NICOLAI A. WALIASCHKO (*J. Russ. Phys. Chem. Soc.*, 1910, 42, 961—1023). Compare Abstr., 1910, ii, 1015).—Phenol, benzaldehyde, and the hydroxy-derivatives of the latter yield two types of absorption spectra. The para-compounds give the phenol spectrum, characterised by one absorption band and designated " ψ ." The meta- and ortho-compounds give the aldehyde spectrum " α " with two absorption bands, α_1 , α_2 . These two types of spectra can occur simultaneously, when a complex spectrum is obtained. Since the molecules of benzene derivatives can often exist in two isomeric forms, such complex spectra are often obtained. Tables and curves are given for the absorption spectra of nitrobenzene, benzaldehyde, *o*-, *m*-, and *p*-tolualdehydes, -nitrotoluenes, -nitrophenols, -nitrophenyl acetates, -nitroanisoles in aqueous, alcoholic chloroform and hexane solutions at various concentration, also of *o*- and *p*-acetoxybenzaldehydes in alcohol and hexane solution, of benzoquinone in aqueous, alcoholic and hexane solution, and of α -benzaldoxime in alcohol. The results are discussed in detail, and are shown to confirm completely the author's view that the entrance of a group in the benzene ring induces a new form of internal vibration, and does not have, as Baly maintains, a merely retarding influence. Nitrobenzene has a strong selective absorption, and in hexane solution gives three absorption bands, α_1 , ψ , α_2 , lying very close to one another, their heads being $\alpha_2 = 1/\lambda$ 3050/3000 mm., $\psi = 1/\lambda$ 3650/160 mm., $\alpha_1 = 1/\lambda$ 4000/40 mm. In alcohol the whole curve lies nearer the red end of the spectrum, and only the bands α_2 , α_1 are to be observed, whilst in water the curve is still nearer the red end and shows only the band α_1 . The other bands now form part of the general absorption, and the selective absorption is thus masked. Benzaldehyde in the same solvents gives similar results, only the whole curve lies nearer the ultra-violet end and the bands are narrower and more stable. Nitrotoluene and tolualdehyde at greater concentrations than those studied by Baly, Tuck, and Marsden (*Trans.*, 1910, 97, 584) give similar absorption curves, with three bands, but, owing to the influence of the methyl group, the bands are broader and nearer the red end of the spectrum. In general, the relation between the *o*-, *m*-, and *p*-nitrophenols and their respective derivatives is almost exactly the same as that between the corresponding hydroxybenzaldehydes.

o-Nitrophenol gives the same type of curve [α_2 and $(\psi + \alpha_1)$] in water, alcohol, chloroform, and hexane, but in the first the spectrum is nearest the red end, and in the last furthest away from that end; the bands are also not equally stable in all the solvents. The curves are complex, and similar to those of *o*-nitroanisole and *o*-nitrophenetole, but the curves of the two latter are of a more strongly marked phenolic character.

o- and *p*-Acetoxybenzaldehydes in very concentrated hexane and

alcohol solution also give the three absorption bands, α_2 , ψ , α_1 , the difference between the ortho- and para-derivatives consisting, like that of the corresponding nitro-derivatives, in the greater stability of the band ψ in the spectrum of the para-compound.

With the formation of an alkali salt, the band α_2 in the *o*- and *m*-isomerides of nitrophenol is moved towards the red end of the spectrum, whereas in the para-isomerides it is the band ψ which is thus affected, but in each case the type of curve is not fundamentally altered.

Whilst not defending the quinonoid theory, the author finds that the spectra of hydroxybenzaldehydes and nitrophenols in alkaline and neutral solutions, and also the spectra of benzaldehyde and nitrobenzene, seem to be very closely related to the absorption spectrum of *p*-benzoquinone.

The disappearance of the yellow colour of an aqueous or alcoholic solution of *p*-nitrophenol on the addition of hydrochloric acid cannot be due to a change in structure of that compound, for the neutral and acid alcoholic solutions give exactly the same form of absorption curve, the only difference being that in the acid solution the curve is slightly nearer the ultra-violet end.

Z. K.

Spectrum of Progressive Phosphorescence of Organic Compounds at Low Temperatures. JOSEPH DE KOWALSKI and J. DE DZIERZBICKI (*Compt. rend.*, 1910, 151, 943—945. Compare Abstr., 1910, ii, 1016).—The phosphorescence spectrum of benzene derivatives in alcoholic solution at the temperature of liquid air is discontinuous, and consists of two superposed series of bands, one of which is due to instantaneous phosphorescence ceasing on removal of the exciting light, whilst the other depends on the more persistent progressive phosphorescence already described. The position of bands of the latter origin has been measured for benzene, toluene, ethylbenzene, propylbenzene, *o*-, *m*- and *p*-xylenes, ψ -cumene, *o*-, *m*- and *p*-tolyl methyl ethers. Introduction of a methyl group into the ring changes the seven doublets of the benzene spectrum into seven broad bands occupying practically the same positions, whilst little effect is produced when the substituent group is in a side-chain. A hydroxyl group in the ring diminishes the number of bands shown by the hydrocarbon, whilst in the side-chain it has little influence. Aromatic amines give a less well defined spectrum when the amino-group is in the ring than when it occurs in the side-chain.

W. O. W.

The Connexion between the Colour and the Structure of Organic Compounds. A. E. PORAT-KOSCHITZ (*J. Russ. Phys. Chem. Soc.*, 1910, 42, 1237—1279).—A theoretical discussion of the structure of a large number of compounds in relation to their colour, and a generalisation of the oscillation theory of the cause of colour in compounds advanced by Baly, Hartley, Hedley, and others. The change in colour of a compound is due to the retarding, or the setting up, of a new type of oscillation within the molecule, by the entrance of a new group, by the formation of a molecular compound, or by the association of the molecules of a solute with those of its solvent. Three

cases are possible: (1) The new oscillation may coincide with and increase the original oscillation; then the absorption bands will move further towards the ultra-violet end of the spectrum, and the colour will remain or become, visibly, colourless. (2) The new oscillation may be of an entirely different type from the original, in which case new bands will appear, and since the original oscillation will be retarded to some extent, there will be a change, but not a very considerable one, in the visible colour of the substance. (3) The new oscillation may combine with the original and greatly retard it, when there will be a considerable, sharp change in colour. Many examples of the three cases are discussed.

Z. K.

Absolute Measurement of Magnetic Double Refraction of Nitrobenzene. A. COTTON and HENRI MOUTON (*Compt. rend.*, 1910, 151, 862—864. Compare *Abstr.*, 1909, ii, 773; 1910, ii, 368).—The recent determinations of the constant for the magnetic double refraction of nitrobenzene not being in good agreement with those of Skinner (*Physical Review*, 1910, 29, 541), fresh determinations were made in conjunction with the latter investigator. As a result of these, the superiority of the method employed by the present authors was established. Application of corrections to Skinner's measurements of the magnetic field, however, bring both sets of results into agreement. The new determinations gave the value 2.53×10^{-12} for the constant of nitrobenzene at 16.3° .

W. O. W.

Photochemical Studies. I. and II. Oxidation of Iodoform by Oxygen. JOH. PLOTNIKOFF (*Zeitsch. physikal. Chem.*, 1910, 75, 337—356, 385—404).—I. The measurements were made in a special form of apparatus, which is fully described. As solvent, benzene was most largely used, and the majority of the measurements were made at 22° . The oxygen concentration was kept constant by bubbling it through the solution; the rate of reaction was followed by titrating the liberated iodine with thiosulphate.

In the dark no oxidation occurs, but in light it proceeds fairly rapidly, and continues in the dark, but less rapidly, after illumination (after-reaction). In light, the rate of the reaction alters in a linear manner with the iodoform concentration. The temperature-coefficient of the after-reaction is 2.61, and the rate is proportional to the 1.28th power of the iodoform concentration. Light appears to have a slight retarding influence on the after-reaction. When allowance is made for the after-reaction, it is shown that the temperature-coefficient of the light action is 1.42, and that the speed tends to a limiting value with increasing concentration. The velocity is proportional to the light intensity, the blue rays being most efficient.

The mechanism of the reaction is discussed. It is possible that it proceeds in the following stages: (1) $\text{CHI}_3 + \text{O} = \text{COI}_2 + \text{HI}$; (2) $\text{COI}_2 = \text{CO} + \text{I}_2$; (3) $2\text{HI} + \text{O} = \text{H}_2\text{O} + \text{I}_2$, and that it is therefore closely connected with the rate of oxidation of hydriodic acid under the influence of light.

II. The oxidation of iodoform was investigated by the method already described in a number of other solvents. The rate of reaction is

greatly influenced by the nature of the solvent, the velocity coefficient at 20° varying from 0·7 in acetone to 39·4 in carbon tetrachloride. The extinction-coefficient for blue rays (and in some instances for violet rays also) has been determined for iodoform in the same solvents by means of the König-Martens-Grünbaum spectrophotometer. Beer's law is valid, but there is no apparent relationship between reaction velocity and the magnitude of the extinction coefficients.

With increase in concentration, the reaction velocity in alcohol tends to a limiting value. The temperature-coefficient is the same as in benzene, 1·42, and the activity of the blue rays constitutes 78% of the total action, as compared with 77% in benzene solution.

Measurements of light absorption have been made for solutions of iodine in benzene, alcohol, and carbon tetrachloride for blue and also for violet rays. For some of these solutions, Beer's law does not apply, as has already been shown by Waentig (Abstr., 1910, ii, 117). It was found that in certain concentrations a solution of iodine in carbon tetrachloride is an efficient filter for blue rays. G. S.

Solution of Oxalic Acid and Uranium Salts as a Chemical Photometer. RAYMOND F. BACON (*Philippine J. Sci.*, 1910, 5, 281—303).—The suitability of a solution containing uranyl acetate and oxalic acid as a photometer has been investigated under various conditions, the quantity of oxalic acid left undecomposed being estimated. The results indicate that sunlight in the tropics is much more powerfully actinic than light in temperate zones.

It is now well established that uranyl salts in solution absorb ultraviolet rays (compare Jones and Strong, Abstr., 1910, ii, 87). Experiments with solutions of varying relative concentrations in (a) oxalic acid and (b) uranyl acetate show that: (1) each increment of 0·05 gram of uranyl acetate increases the speed of reaction by 18%, to a maximum at which 92% of the oxalic acid is decomposed, and (2) the reaction is constant for varying amounts of oxalic acid. Acids and alkalis have no effect provided they do not reduce the content of the solution in uranyl salt, and ammonium oxalate behaves like oxalic acid. Uranyl nitrate has about the same effect as an accelerator as uranyl acetate. No decomposition takes place if the solution is made slightly alkaline, so that a certain proportion of hydrogen ions appears to be necessary, but these ions do not act *per se*, and probably merely serve to ensure the presence of uranium in the form of a uranyl salt. Oxalic acid solution is decomposed by sunlight alone, but the action is greatly accelerated by uranyl acetate. Alkaloids act as poisons in this catalysis. The action takes place at much the same rate over temperatures ranging from 30° to 100°. Fay (Abstr., 1896, i, 464) has stated that there is possibly no limit to the decomposition of oxalic acid by sunlight in presence of uranyl acetate, but in the present experiments it was found that 0·1 gram of uranyl acetate can in sunlight effect the decomposition at most of 1·5 grams of oxalic acid. Bach's observation that formaldehyde and hydrogen peroxide are formed by the action of carbon dioxide on water in presence of uranyl acetate (Abstr., 1893, ii, 484) could not be confirmed, but it was noted that glyoxylic acid is one of the products of the decomposition of uranyl

acetate by sunlight. Observations carried out by Duclaux, utilising the decomposition of a solution of oxalic acid by sunlight, indicated that the actinic power of sunlight is greater in the temperate zone than in the tropics, but the author considers that these observations were due to stratification of the air in the district in which Duclaux's experiments were carried out, and experiments carried out by Duclaux's method in Manila indicated a higher rate of decomposition there than in temperate regions. The decomposition of oxalic acid in solutions exposed to sunlight is due to the formation of hydrogen peroxide and the increased sensitiveness of old solutions of the acid to which Duclaux calls attention is due to the large amount of hydrogen peroxide present.

T. A. H.

The Volatilisation of Radium Emanation at Low Temperatures. R. W. BOYLE (*Phil. Mag.*, 1910, [vi], 20, 955-966. Compare Laborde, *Abstr.*, 1909, ii, 634).—Almost inappreciable differences in the temperature at which small quantities of radium emanation, condensed in spiral tubes, volatilised were found for surfaces of metals and of glass. Using the emanation in equilibrium with from 2×10^{-4} to 2×10^{-3} mg. of radium bromide, a rate of rise of the spiral, immersed in a bath of pentane, of about 0.4° per minute, and gas currents of 0.12 c.c. per second (at -160°), there was a slight and increasing volatilisation until the temperature approached -160° , and then the volatilisation became very sudden, practically none being condensed above -160° . For the glass spiral the volatilisation temperature was about 4° lower than for a metal one, the error of temperature reading being about $\pm 2^\circ$. With spirals of only 2 or 3 coils arranged with their axes horizontal instead of vertical, and the thermocouples inside the tubes, no difference in the volatilisation temperature between glass and lead spirals could be detected.

F. S.

Attempts to Evaluate the Period of Ionium. FREDERICK SODDY (*Le Radium*, 1910, 7, 295-300).—The paper deals with the attempts that have been made to detect a growth of radium from uranium, and a growth of α -radiation from uranium-*X* preparations (*Abstr.*, 1910, ii, 921, 922), which agree in giving for the minimum period of ionium at least 35,000 and probably 50,000 years, on the assumption that only one long-lived product is intermediate between uranium and radium. A further attempt to estimate the period depends on the simultaneous determinations of (1) the quantity of helium, and (2) the proportion of the equilibrium amount of radium (Soddy and Pirret, *Abstr.*, 1910, ii, 922) in Portuguese autunite. It was found, unexpectedly, that the quantity of helium did not vary in the same direction, in different specimens, as the proportion of radium. The specimen with the smallest quantity of helium, corresponding with less than would be produced in 30 years, had the highest proportion of radium, which was about 70% of the equilibrium proportion. Another specimen with helium corresponding with an age of 600 or 700 years had a radium proportion of 44%. A specimen of French autunite found by A. S. Russell (*Nature*, 1910, 84, 238) to have a

radium proportion of only 27%, the lowest yet observed, contained helium corresponding to an age of at least 3000 years. The first specimen examined, for which a radium proportion of 44% had been found previously (Pirret, *loc. cit.*), contained 77,000 years' production of helium. The suggestion is advanced that the radium in autunite is often that initially deposited with the mineral during formation, owing to the isomorphism of calcium and radium, and that this decays for the first few thousand years, owing to the initial absence of ionium, to a minimum proportion, and then rises more slowly, owing to the regeneration of ionium from the uranium. A method of deducing the period of ionium from the radium proportion and helium content of specimens more than a few thousand years old is discussed, which depends on the possibility of regarding radium as a short-lived product by comparison with its direct parent, ionium. F. S.

Chemical Investigation of Actinium-containing Residues of Radium Extraction. I. C. AUER VON WELSBACH (*Sitzungsber. K. Akad. Wiss. Wien*, 1910, 119, [ii a], 1-44*).—The chemical operations in the treatment of 1800 kilograms of "hydroxides," containing 78% of water, derived from 10 tons of Joachimsthal pitchblende, are described in detail. The material contained actinium and ionium. Two different methods were employed, the "sulphate method" for a relatively small part, and the "oxalate method" for the remainder. The ionium followed all the reactions of thorium, whereas actinium stands between lanthanum and calcium. In the first method the moist hydroxides were treated with sulphuric acid, the residue of basic bismuth sulphate, lead and rare earth sulphates filtered off, and the mother liquor concentrated to remove iron alum and precipitated with oxalic acid. In the residue, the radioactive matter (actinium) followed the reactions of lanthanum. It separated out in several cases as a manganate when the mother liquor from the oxalate precipitations was kept, a reaction which proved of great service, for actinium is, in the presence of ammonium salts, not completely precipitated either by ammonia or ammonium oxalate. From the solution of the first precipitate of rare earth oxalates, freed from heavy metals, hydroxides were fractionally precipitated in presence of much ammonium nitrate by precipitating a portion with ammonia and stirring it into the main quantity ("hydroxide method"). The most basic part is iron, then come thorium, uranium, scandium, the ytterbium group, the yttrium group, the cerium group, whilst calcium and analogous elements remain in solution. From the rare earths the greater part were removed inactive by precipitation of the sulphates with ammonium sulphate, the radioactive matter keeping with the earths not precipitated, and with those the oxalates of which are soluble in ammonium oxalate (thorium).

In the "oxalate method" the hydroxides were dissolved in hydrochloric acid, the bismuth precipitated as basic chloride by ammonia, and the filtrate precipitated with oxalic acid and then ammonia, so long as the oxalate precipitate increased. The solution of the rare earth oxalates, freed from heavy metals, was precipitated by the

* and *Monatsh.*, 1910, 31, 1159-1202.

"hydroxide method," so as to give the iron, thorium, and uranium in one fraction, which contained all the radioactive matter. By various methods the actinium was obtained with the lanthanum and the ionium with the thorium. All attempts to concentrate the ionium from the thorium failed, although numerous methods were tried. Heating the preparations in an electric arc did not effect the proportion of ionium and thorium.

F. S.

Units of Measurement of Radium and of Radioactivity.
 A. JABOIN (*J. Pharm. Chim.*, 1910, [vii], 2, 494—497).—The new proposals of the Brussels Congress of Radiology for units of measurement in radioactivity are reviewed. With regard to the γ -ray method of measuring radium, Mme. Curie will prepare a standard, to be kept in Paris, containing about 20 mg. of radium (element). With regard to the emanation method, the unit, to be called the "curie," is to be the quantity of radium emanation in equilibrium with 1 gram of radium (element), with the subdivisions "millicurie" and "microcurie."

F. S.

Mesothorium. WILHELM MARCKWALD (*Ber.*, 1910, 43, 3420—3422).—An investigation of a "radium preparation" sent for examination from a factory, where it had been prepared from the residues of uranium and thorium earths, showed that only about 20% of the γ -rays was due to radium, as estimated by means of its emanation, and that the remainder was derived from mesothorium. Mesothorium is apparently completely similar in chemical nature to radium, and no reaction was found capable of separating it from barium and radium. By crystallisation of the chloride, the mesothorium is concentrated with the radium in the less soluble portion. The complete chemical similarity of radium and mesothorium is analogous to that existing between thorium, radio-thorium, ionium, and uranium-X. Mesothorium can therefore be separated from the residues of the thorium manufacture by copying the methods employed in separating radium from uraninite residues. The danger of intentional or unintentional adulteration of radium preparations by mesothorium must be borne in mind. The simplest test is to heat or dissolve the preparation to drive off the emanation. In three hours the γ -rays from the preparation after this treatment should have completely disappeared. If mesothorium is present, the proportion of the γ -radiation before and after this treatment gives a measure of the proportion of radium and mesothorium.

F. S.

Analysis of the Radioactivity of Some Thermal Waters of the Island of Ischia. OSCARRE SCARPA (*Gazzetta*, 1910, 40, ii, 285—321).—The author has examined the waters of a number of thermal springs in the island of Ischia, and has found all to be radioactive, although the different sources differ considerably in this respect. In all cases the activity seems to be due to radium emanation, but the waters of Porto d'Ischia probably contain also a very small quantity of thorium emanation.

R. V. S.

[Radioactivity of] the Hot Springs of Iceland. THORKELL THORKELSSON (*Mémoires de l'Acad. Royale des Sciences et des Lettres de Danemark, Copenhague*, 1910, [vii], 8, 182—264).—The radioactivity of numerous hot springs in Iceland, both of the evolved gases and of the mud, siliceous sinter, and other deposits, has been examined. No activity could be detected in the deposits, and it is estimated that none of them could have contained more than twenty-five times as much radium as the average common rocks. The gases were also analysed, and their content of argon and helium in some cases determined.

The results are fully discussed from the point of view of existing theories of geyser action. The presence of radium emanation in the springs and the absence of radium in the deposits is in favour of the view that the heat of the hot springs is derived from steam from lower levels, not from hot water. The data indicate that for one class of hot springs carbon dioxide, hydrogen, and hydrogen sulphide are produced simultaneously by the same process in the ratio 71:11·5:14·5, about 3% being nitrogen, probably of atmospheric origin. In other springs the gas consists entirely of nitrogen and rare gases, the percentage of argon (maximum 2·5) being, with only one exception, greater than in the atmosphere, the percentage of helium and neon in the argon varying from 0·5 to 4·8. Some of the samples showed a pure helium spectrum, whilst in others the neon spectrum was intense. Only the emanation of radium was found in the springs, other emanations being either absent or present only in small amount. The emanation measurements did not throw light on the nature of hot springs, and there is no definite proof that the heat energy is directly connected with the radioactivity, which apparently increases with the height of the spring above sea level. The general order of the radioactivity of the Icelandic springs is the same as those of Germany and Austria. The unit of emanation employed per c.c. of water is that produced by the radium in equilibrium with 1 gram of uranium per second (which multiplied by 2·11 gives Mache units). The highest result in these units is 35 ("Kerlingaufjöll, No. 3"). The majority of the springs examined possess from 3 to 7 of these units. F. S.

Radioactivity and Ferment Action. KÖRNER VON KÖRÖSY (*Pflüger's Archiv*, 1910, 187, 123—143).—Radium rays caused no inversion of a sucrose solution. Minute quantities of a radium-barium salt containing 0·005% of radium bromide increased the velocity of decomposition of hydrogen peroxide, on the average, nine times. Radium emanation dissolved in water acted similarly. Many experiments pointed to an after working, the velocity of decomposition in a preparation which had been exposed to the rays of radium continuing for some days after exposure to be greater than that of an unexposed preparation. A review of the literature of the action of radioactive substance on ferments is given. F. S.

The Positive Thermions Emitted by the Alkali Sulphates. OWEN W. RICHARDSON (*Phil. Mag.*, 1910, [vi], 20, 981—999. Compare Abstr., 1910, ii, 923).—The value of e/m for the positive ions emitted

by the sulphates of the different alkali metals was determined by the method previously employed. Values were found for the sulphates of lithium, sodium, potassium, rubidium, and caesium, which, on the assumption that e is the single atomic charge, give values for m in close agreement with the atomic weights of the alkali metals. The conclusion is drawn that the positive ions emitted from the alkali metal sulphates, when heated, are identical with the positive ions existing in their solutions. So far the only negative thermions detected have been electrons.

F. S.

The Positive Thermions Emitted by the Salts of the Alkali Metals. OWEN W. RICHARDSON (*Phil. Mag.*, 1910, [vi], 20, 999—1000).—Sodium iodide and fluoride showed no difference in the value of e/m for the positive ions emitted, the value found being within 5% the same as that found for the electrolytic sodium ion. The nature of the positive thermion emitted depends only on the nature of the metal, not on that of the acid radicle.

F. S.

Electrical and Mechanical Properties of Alloys of the Noble Metals. WILHELM GEISEL (*Zeitsch. anorg. Chem.*, 1910, 69, 38—46).—The relations established between the constitution of alloys and their electrical properties render it possible to determine the constitution from electrical measurements in cases in which the melting points are too high for thermal analysis.

Binary alloys containing the platinum metals, gold, and silver have been examined, the electrical conductivity and thermo-electric power (against platinum) being determined with wires 0·1 mm. in diameter, and the tensile strength with wires 1 mm. in diameter. The temperature-coefficients of the conductivity are determined by means of measurements at intervals of temperature during cooling from 180°.

In the alloys of palladium and gold, the curves are of the expected form, but the minima do not coincide. The minimum conductivity occurs at 35 atomic % of gold, the minimum temperature-coefficient and thermo-electric power at 45, and the maximum tensile strength at 56 atomic % of gold. The addition of gold greatly increases the thermo-electric power of palladium measured against platinum. Thus the alloy with 60% Au has against platinum four times, and against gold six times, as great an *E.M.F.* as the platinum platinum-rhodium couple.

C. H. D.

Conductivity, Dissociation, and Temperature-coefficients of Conductivity at 35°, 50°, and 65° of Aqueous Solutions of a Number of Salts. XIV. A. P. WEST and HARRY C. JONES (*Amer. Chem. J.*, 1910, 44, 508—544).—This work is a continuation of that of Clover and Jones (*Abstr.*, 1910, ii, 256), in which the conductivities of aqueous solutions of various compounds, both inorganic and organic, were determined at temperatures between 35° and 80°. In the present case, however, the measurements have not been made at temperatures above 65° on account of the solubility of glass in water at the higher temperatures.

The results obtained at various dilutions are recorded for ammonium

bromide, ammonium hydrogen sulphate, sodium iodide, carbonate and acetate, potassium hydrogen sulphate, potassium iodide, carbonate, dichromate and ferrocyanide, lithium bromide, nitrate and sulphate, calcium bromide, nitrate and formate, strontium bromide, nitrate and acetate, barium nitrate, formate and acetate, magnesium bromide, formate and acetate, cadmium chloride, bromide and iodide, zinc sulphate, manganese chloride, cobalt chloride, bromide, nitrate and acetate, nickel chloride, aluminium nitrate and sulphate, chromium nitrate and acetate, and uranyl chloride, nitrate, sulphate and acetate. These data show that the same relations exist between conductivity and temperature in the case of these salts as in that of the substances previously studied (Jones, Abstr., 1906, ii, 327; Jones and Jacobson, Abstr., 1908, ii, 1011; Clover and Jones, *loc. cit.*). The various factors which contribute to the increase of conductivity of solutions of electrolytes with rise of temperature are again discussed. E. G.

Electrical Conductivity of Potassium Bromide and Potassium Silver Cyanide in Mixtures of Glycerol and Alcohols. LEO PISSARJEWSKY and A. SHAPOVALENKO (*J. Russ. Phys. Chem. Soc.*, 1910, 42, 905—938. Compare Pissarjewsky and Trachoniotowsky, Abstr., 1910, ii, 402).—The purpose of the research was to elucidate the relation between the equilibrium constant (of a certain reaction in different solvents) and the change in the degree of dissociation of the reacting substances.

Potassium silver cyanide is the salt of a monobasic acid, $\text{HAg}(\text{CN})_2$. At 25° the electrical conductivity of potassium bromide and potassium silver cyanide respectively are practically identical in corresponding solvents and dilutions—the only exception being a 25% methyl alcohol and 75% glycerol solution, when the values for potassium bromide are higher than for potassium silver cyanide. At 45°, however, the corresponding values for the two salts are not identical. The addition of glycerol to both methyl and ethyl alcohol considerably decreases the electrical conductivity of the dissolved salts, and for both salts the relation $\mu_{\infty} \cdot \eta_{\infty}$ in mixtures of glycerol and methyl alcohol / $\mu_{\infty} \cdot \eta_{\infty}$ in mixtures of glycerol and ethyl alcohol, is constant and equals 2.08.

In glycerol itself, the electrical conductivity of the salts is very slight. The product $\mu_{\infty} \cdot \eta_{\infty}$ is constant for pure (unmixed) solvents of similar chemical properties, and belonging to the same homologous series; thus it is constant for both salts in methyl and ethyl alcohol respectively, whatever the temperature, also for one and the same salt in any one given solvent at varying temperatures, but not, in general, for mixtures of glycerol with either alcohol. Consequently, the law deduced by Walden for tetraethylammonium iodide, NEt_4I , in various organic solvents, that $\mu_{\infty} \cdot \eta_{\infty}$ does not depend on the nature of the solvent and on the temperature, is not generally applicable.

The relation between the degree of dissociation of potassium silver cyanide (α) and that of potassium bromide, α_1 , that is, α/α_1 , is constant for mixtures of glycerol with methyl and ethyl alcohols, and also for both the latter with water.

The alteration in the equilibrium constant of the reaction : $2\text{AgCN} + \text{KBr} \rightleftharpoons \text{KAg}(\text{CN})_2 + \text{AgBr}$ is not due to the unequal

alteration in the degree of dissociation of the reacting substances when passing from one solvent to another. Z. K.

Influence of the Solvent on the Equilibrium Constant
 LEO PISSARJEWSKY and I. LITVIN (*J. Russ. Phys. Chem. Soc.*, 1919, 42, 1062—1068. Compare preceding abstract).—The reaction $2\text{AgCN} + \text{KBr} \rightleftharpoons \text{KAg}(\text{CN})_2 + \text{AgBr}$ in pure water has an equilibrium constant $K = 8.5$. As the non-electrolytes acetone, methyl and ethyl alcohols are added respectively, K diminishes until they constitute 25% of the solvent, at which it is a minimum in each case. Further addition now raises K ; at 50% ethyl alcohol, $K = 8.8$, whilst at 75% methyl alcohol, $K = 21.8$.

There is no definite relation between μ (specific conductivity) and K (diminution of the free energy of the reaction).

For the reaction $\text{AgCNS} + \text{KBr} \rightleftharpoons \text{KCNS} + \text{AgBr}$ in aqueous solutions, $K = 0.531$, which is not appreciably diminished by the addition of mannitol. The experiments, in general, confirm the conclusion arrived at by the author and Trachoniotowsky (Abstr., 1910, ii, 402). Z. K.

Influence of Pressure on the Electrolytic Conductivity of Solutions in Different Solvents. E. W. SCHMIDT (*Zeitsch. physikal. Chem.*, 1910, 75, 305—336).—The effect of varying the pressure from 1 to 3000 kilog./cm.² on the electrical conductivity of highly dissociated electrolytes (tetraethylammonium iodide, and, in a few instances, sodium and potassium iodides) in eleven typical organic solvents at intervals of temperatures from 0° to 60°, and of a weak electrolyte (malonic acid) in some of these solvents, has been investigated by the method used by Bogojawlensky and Tammann (compare Abstr., 1899, ii, 137). As solvents, methyl, ethyl, and *isoamyl* alcohols, glycerol, furfuraldehyde, benzaldehyde, anisaldehyde, acetic anhydride, phenylacetonitrile, nitrobenzene, and acetone were used. The effect of pressure on the conductivity is due to three factors: (a) change of volume, (b) alteration of viscosity, (c) change in degree of dissociation, and the experimental results are discussed in terms of the relative importance of these factors.

For solutions of highly dissociated electrolytes in organic solvents, the resistance increases considerably with the pressure, the magnitude of the effect being much greater than in aqueous solution. For weak electrolytes the effect is less. In the case of *N*/10-malonic acid in ethyl alcohol, the resistance above 8° diminishes, below 8° increases, with increase of pressure. For the same solute in equal concentration in *isoamyl* alcohol, there is a minimum in the resistance at 40° and 60°. The influence of pressure on the ionic viscosity diminishes as the temperature is raised; the temperature-coefficient of the pressure influence is smaller the higher the temperature. The influence of pressure on the resistance also diminishes with increasing concentration.

As regards the solutions of tetraethylammonium iodide, the logarithm of the resistance increases approximately, in some cases quite accurately, in proportion to the increase of pressure. For non-

associated solvents the influence of pressure on the resistance at 20° increases in a linear manner with the viscosity of the solvent referred to the same temperature and 1 kilo./cm.² pressure. Solutions in associated solvents do not follow the above rule, the influence of pressure being much smaller.

G. S.

Dependence of Contact Electrification on the Capacity of Ionic Dissociation and on Superficial Density. NICOLAUS A. HESSAUER (*J. Russ. Phys. Chem. Soc. (Phys.)*, 1910, 42, 368-374. Compare *ibid.*, 1901, 33, 19).—The dependence of contact electrification on the capacity of ionic dissociation and on the superficial density stated to exist by the author in 1901 is now confirmed by experiment. The superficial density can be represented by $(\Delta/a)^{2/3}$ (where Δ =density of the substance, a =its atomic weight), and if d =the number of atoms (or molecules in a compound), then $d=(\Delta/a)^{2/3}$. If, further, ρ =time taken by the leaves of a spectroscope to fall through ten divisions, when connected with a negatively electrolysed substance under the influence of ultra-violet rays, then the capacity of ionic dissociation is represented by $(\Delta/a)^{2/3}/\rho$.

Tables are given showing that the electric properties of metals depend chiefly on their capacity of ionic dissociation, and also that whilst the metal's can be arranged in a voltaic series from + to -, with increasing hardness and surface density, in a similar series for dielectric substances, such as water, glycerol, etc., the values for the surface-tension and density decrease from + to -. Z. K.

Electrochemical Behaviour of Cobalt. R. SCHULDBACH (*Zeitsch. Elektrochem.*, 1910, 16, 967-979).—The difference of potential between cobalt and a N -solution of the chloride (measured in an atmosphere of nitrogen) is -0.293 volt and -0.339 volt for 0.1*N*-cobalt chloride. For the sulphate the corresponding values are -0.316 and -0.339 volt, compared with the normal hydrogen electrode, the sign being that of the cobalt electrode. These values were obtained with cobalt powder; the massive metal gives rather more positive values, -0.288 volt in N -cobalt sulphate, for example. Cobalt powder charged with hydrogen gives considerably more negative values at first, which gradually change until the equilibrium potential is reached. When unpolarised cobalt is placed in a cold solution of one of its salts, its potential is more positive than the equilibrium value, -0.12 volt, for example, but the equilibrium value is reached fairly quickly.

From neutral solutions, in an atmosphere of hydrogen, cobalt is deposited with quantitative current efficiency. The difference of potential between the electrode and the electrolyte is, however, much larger than the equilibrium value. The difference increases with the current density, and diminishes as the temperature rises, almost vanishing at 90°; it is very much increased by the addition of small quantities of acid to the solutions, and this effect is especially marked at low temperatures. In its electrochemical behaviour, generally, cobalt occupies an intermediate position between iron and nickel.

T. E.

Zinc Amalgams and the Clark Element. ERNST COHEN and P. J. H. VAN GINNEKEN (*Zeitsch. physikal. Chem.*, 1910, 76, 437—493).—It is shown both by electromotive and dilatometer experiments that the 10% zinc amalgam has a transition point at 42.9°, and a second transition point at 20°. On the basis of these results and the previous measurements of Cohen and Inouye (compare Abstr., 1910, ii, 37), the equilibrium diagram for zinc-mercury is constructed, and applied to explain the behaviour of the Clark cell.

If a 10% zinc amalgam is placed in one limb of the Clark cell in the fused state and allowed to cool, above 42.9° there is a heterogeneous amalgam, consisting of a solution and of mixed crystals containing very little mercury. Below 42.9° these mixed crystals unite with the liquid phase to form a second series of mixed crystals, richer in mercury. This transition is fairly rapid, and is certainly complete in one day at 25°. Below 20° the mixed crystals just referred to combine with the liquid phase to form still another series of mixed crystals; this change is very slow. At 0° nine days are required to complete it, and at temperatures from 10—15° it takes very much longer. This agrees with the observations of Willows (*Phil. Mag.*, 1899, [5], 48, 43), who found that at room temperature the amalgam sometimes required six weeks to reach its final state. A second complication below 20° is the time taken to establish the equilibrium concentration of the mixed crystals, but this is a faster change than the other just described. The results of previous observers with the Clark cell are discussed in the light of these observations.

G. S.

Behaviour of Iron and Nickel Anodes in Various Electrolytes. EUGENE P. SCHOCK and C. P. RANDOLPH (*J. Physical Chem.*, 1910, 14, 719—737).—The conditions under which a nickel anode becomes passive in sulphate and chloride electrolytes were investigated by Schock (Abstr., 1909, ii, 371). In view of subsequent publications, the authors adopt the theory that the passivity is due to oxide formation and not to protection of the anode surface by a layer of gaseous oxygen. The film of oxido necessary to produce all the characteristic effects may be less than is optically perceptible. When the anode becomes active again at a higher voltage, as with chromium and manganese, the ions produced contain oxygen as chromat-ions, etc. Experiments carried out with nickel in six different electrolytes and iron in sixteen electrolytes lead to the conclusion that both modes of anode action, that is, metal dissolution and oxide formation, are specifically influenced by the particular anions present.

The electrolytes, arranged in increasing order of their tendency to effect oxidation, are: (1) halogens, (2) sulphates, (3) acetates, (4) perchlorates, (5) nitrates, (6) chromates, chlorates, bromates, iodates, hydroxides, the last five being classed together, although iodates have perhaps the greatest activity.

On breaking circuit, a passivised anode quickly returns to its original condition in acidic electrolytes and slowly in neutral electrolytes. In the latter case, the restoration of the active surface is immediately effected by boiling, but in alkaline solutions the original solution potential of the metal cannot be attained even by boiling.

In mixed electrolytes each anion exercises an influence proportional to its concentration. The dependence of metal dissolution on the specific nature of the anion indicates that some individual interaction takes place between anions and anode, or between anions and nascent metal ions. Alkaline acetate solutions are able to convey currents of greater density than sulphates on account of the anodic depolarisation resulting from oxidation of the acetone to methyl alcohol.

The effect of these experiments on the problem of the corrosion and passivating of iron is indicated, and the conclusion is drawn that "chromating," etc., will not protect iron from the action of a natural water containing sulphates or chlorides.

R. J. C.

Migration of Ions in the Water Voltameter. FRANZ STREINTZ (*Zeitsch. Electrochem.*, 1910, **16**, 980. Compare *Abstr.*, 1910, ii, 928).—Using more accurate values of the transport numbers of sulphuric acid, the agreement between the observed and calculated changes of level in the voltameter becomes very much closer.

T. E.

Electrophoresis of Lamp-black. WALTHÈRE SPRING (*Bull. Soc. him. Belg.*, 1910, **24**, 416—420).—A criticism of the results obtained by Keychler (*Abstr.*, 1910, ii, 1030), and of his views on the detergent action of soap. The methods adopted by Keychler for the purification of the lamp-black were not so thorough as those used by the author, and hence the different results.

T. S. P.

Influence of the Spark on the Frequency of Electrical Vibrations. D. ROSCHANSKY (*Physikal. Zeitsch.*, 1910, **11**, 1177—1181).—The author discusses from a theoretical point of view the variation in the form of electrical discharge in its dependence on the length of the spark-gap and the electrode-material. If the metals, which have been investigated, are arranged in the order of the symmetry of the discharge, the series magnesium, bismuth, cadmium, zinc, aluminium, copper, and silver is obtained. This is the same order as was found by Wien for the effect of the various metals on the displacement of the resonance curves.

H. M. D.

Method for Making Two Substances React in the Electric Arc. E. A. SALMON (*Compt. rend.*, 1910, **151**, 1057—1058).—The electrodes employed are pierced with canals parallel to their axes; the reacting substances enter the arc through one electrode, and the products of the reaction escape through the other. The electrodes are freely movable in a quartz jacket.

The formation of cyanogen from carbon and nitrogen has been shown by this apparatus, and also the rapid decomposition of water vapour when the electrodes are of copper.

W. O. W.

Magnetisation at Very Low Temperatures. PIERRE WEISS and H. KAMMERLINGH ONNES (*Arch. Sci. phys. nat.*, 1910, [iv], 30, 341—355, 449—475).—The study of the variation of magnetism with temperature has been continued down to temperatures not far removed from the absolute zero. A comparison of the magnetisation at the

ordinary temperature and at low temperatures for several high values of the field shows that this ratio is practically independent of the field.

The law of corresponding states is found to hold good very accurately for magnetite at temperatures near to the critical point, but at very low temperatures the divergence is greater.

Vanadium, chromium, and Goldschmidt's manganese are not appreciably more magnetic at the temperature of liquid or solid hydrogen than at the ordinary temperature, whilst manganese, prepared by electrolysing the pure chloride with a mercury cathode, heating in hydrogen to expel mercury, and fusing in a magnesia cylinder in hydrogen, is markedly ferromagnetic. The powdery material before fusion may be compressed to form a cylinder, and then shows only paramagnetic properties.

The following ratios are found between the intensities of magnetisation at the temperature of liquid hydrogen and at the ordinary temperature : nickel, $I_{20^{\circ}\text{ abs}}/I_{15^{\circ}\text{ S}} = 1.0548$; iron, $I_{20^{\circ}\text{ abs}}/I_{20^{\circ}\text{ S}} = 1.0210$; magnetite, $I_{20^{\circ}\text{ abs}}/I_{15^{\circ}\text{ S}} = 1.0569$.
C. H. D.

Sublimation of Ammonium Chloride. RUDOLF WEGSCHEIDER (*Zeitsch. physikal. Chem.*, 1910, 75, 369—370).—Scheffer's theory of the ammonium chloride equilibrium (compare Abstr., 1910, ii, 484) is substantially the same as, and leads no further than, that of the author (compare Abstr., 1909, ii, 23). G. S.

Calorimetric Investigation of Chlorine at Low Temperatures. TADEUSZ ESTREICHER and M. STANIEWSKI (*Bull. Acad. Sci. Cracow*, 1910, 349—351).—A weighed quantity of chlorine, contained in a closed, thin-walled, glass bulb-tube, was cooled to -192° , -108° , and -80° , and then immersed in a water calorimeter at room temperature. From the observed thermal changes, it is found that the specific heat of solid chlorine between -192° and -108° is 0.1446 . This gives 5.13 for the atomic heat of solid chlorine. The specific heat of liquid chlorine between -80° and 15° is 0.2230 .

From these data and the observations between -108° and 15° the authors have obtained 22.96 cal. for the latent heat of liquefaction of solid chlorine. This result is obtained on the assumption that the melting point is -103.5° .
H. M. D.

The Heat of Vaporisation of Certain Liquefied Gases. TADEUSZ ESTREICHER and AL. SCHNERER (*Bull. Acad. Sci. Cracow*, 1910, 345—348).—The heats of vaporisation of liquid sulphur dioxide, hydrogen chloride, bromide and iodide, chlorine, ammonia, and hydrogen sulphide have been measured. The apparatus used has been described previously (Abstr., 1904, ii, 478). The vaporised gases were absorbed by suitable reagents, and to prevent super-heating, the liquids were brought to a state of steady ebullition by means of a small secondary heating coil before the current was passed through the much larger primary coil.

The following results were obtained:

	SO_2	HI	HBr	HCl	Cl_2	NH_3	H_2S
Temperature ...	-11.16°	-37.2°	-69.86°	-81.3°	-35.8°	-33.4°	-61.37°
Molecular heat							
of vaporisation	6106.7	4331.8	3939.1	3600.3	4371.9	5461.9	4494.8 cals.
Trouton's constant	23.3	18.5	19.4	19.1	18.4	22.75	21.3

The values of the Trouton constant for these liquefied gases are therefore approximately normal.

H. M. D.

Specific Gravities at the Melting Point in Relation to Constitution. JOHN C. EARL (*Chem. News*, 1910, 102, 265).—On the assumption that the carbon, hydrogen, and oxygen atoms in combination are spheres of equal size at the respective melting points of the substances containing them, the density of a compound containing these elements only may be calculated from the formula: density = molecular weight/[$n \times 4\pi/3 + (2n+2)0.894$], where n represents the number of atoms in the molecule at the melting point. It is stated, however, that in many cases the formula does not hold. G. S.

Measurement of the Viscosity of Liquids and of Lubricants. OSCAR SCARPA (*Gazzetta*, 1910, 40, ii, 261—285).—The usual Poiseuille viscometers are inaccurate, because the capillaries are too short and too wide, so that the flow may not follow Poiseuille's law, or, when comparisons are being made, the flow may follow different laws according to the time of outflow. The author further shows that the following sources of error are not negligible: (1) the variation in pressure due to the change in level of the liquid during the flow, even when an external pressure is applied; (2) the different densities of the liquids investigated (where the flow is caused by the liquid itself without external pressure); (3) capillary phenomena associated with the movement and change of shape of the meniscus during the flow. It is possible to calculate the relative values which the size of bulb, length and diameter of the capillary must have in order that some of these errors shall be negligible.

In the new viscometer now described, a capillary 5—10 cm. in length and about 0.02 cm. in diameter is employed. In it, bulbs of the following sizes are blown in close proximity to each other: (a) 1 c.c.; (b) 5 c.c.; (c) 10 c.c.; (c') 1 c.c. The bulb used for a particular experiment is chosen from *a*, *b*, and *c*, according to the viscosity of the liquid. The capillary ends either in a U-tube 30 cm. long and 2 cm. in diameter, or is suspended by means of a cork in a wide, cylindrical tube. The negative pressure employed to cause the flow of the liquid is produced in an aspirator of 15 litres capacity, the air in which is in connexion with a pressure regulator. This consists of a burette having a flask-like expansion at the top, its capacity being about 1 litre. The vessel is nearly filled with water, and by drawing off known volumes of it from the burette, or adding them through a tap funnel at the top, the pressure inside the apparatus can be varied as desired. In measuring a viscosity, the time, t_1 , occupied by the liquid in emptying the bulb is observed, the flow being caused by the algebraic sum of the pressure (P) applied to it and its own

mean difference of level. Both ends of the viscometer are then connected with the atmosphere, and the time, t_2 , which the liquid takes to flow in again under the pressure due to its own difference of level alone is noted. If V be the volume of the bulb, R the radius of the capillary, and L its length, then $\eta = \pi R^4/8VL.P \times t_1 t_2 / t_1 + t_2 = t_1 t_2 / t_1 + t_2 \times$ constant, if the same pressure P be always established. The value of the constant for a particular apparatus can be determined most readily by measuring $t_1 t_2 / t_1 + t_2$ for a liquid (such as water) of which the absolute coefficient of viscosity is known with accuracy. A mathematical discussion is given of the magnitude of various errors and of the conditions necessary for avoiding them. The three bulbs mentioned above are designed to suit the measurement of viscosities ranging from one-tenth to ten times that of water at 20°. For oils, the author maintains these sizes of bulbs, but uses a capillary 10 cm. long having a diameter of the order of 0.05 cm.

With this viscometer the author has carried out measurements of the viscosity of some common lubricants (steam turbine oil, bearing oil, cylinder oil) at different temperatures, and obtains values differing considerably from those given by the Engler viscometer generally used. From a comparison of the curves plotted from the two sets of results, he shows that great errors are committed when the Engler results are extrapolated to higher temperatures. The incorrectness of the Engler viscometer in these cases is due to the fact that when the liquid is very viscous its flow in that viscometer does not follow Poiseuille's law.

R. V. S.

Efflux pressure of Isomorphous Mixtures of *p*-Dihalogen derivatives of Benzene. NICOLAI N. NAGORNOFF, S. F. SCHENKSHUCHNY, and NICOLAI S. KURNAKOFF (*J. Russ. Phys. Chem. Soc.*, 1910, 42, 1168—1179*).—A short survey of the thermal and other physical properties of mixtures of *p*-dihalogen benzene derivatives, temperature-pressure and concentration-hardness curves, as well as tables of melting points and vapour pressures of the dihalogen derivatives, being given. The measurements of the efflux pressure were carried out in Gagarine's dynamometer, and the results are given in a series of tables and curves. The pressure-concentration curve of the continuous isomorphous mixtures of *p*-dichloro- and *p*-chlorobromobenzene, m. p. 64.5°, has a maximum at 11.15 kilogram/mm.² at the composition 10 mol. % of dichlorobenzene, whilst the maximum for the *p*-dibromo- and chlorobromo-benzene curve lies at 17.50 kilogram/mm.² at the composition 75% (mol. %) of dibromobenzene. The behaviour of a 50% mixture of dibromo- and dichlorobenzene is entirely different from that of chlorobromobenzene, and the individuality of the latter compound is well shown on the pressure curve. Still more strongly marked is the individuality of bromiodobenzene in the systems of the latter with dibromo- and di-iodobenzene respectively. The maxima of the curves lie at 25.9 kilogram/mm.² at 50% dibromobenzene and at 51.7 kilogram/mm.² and 90% (mol. %) di-iodobenzene respectively. The maximum for the dichloro-chloroiodo-benzene curve lies at 16.8 kilogram/mm.² and 90%

* and *Zeitsch. physikal. Chem.*, 1910, 75, 578—584.

chloriodobenzene. The measurement of the efflux pressure is a very delicate method of establishing the existence of a definite chemical compound in a homogeneous solid medium, which is the characteristic of isomorphous mixtures. Z. K.

The Viscosity of the Dispersoids. EMIL HATSCHER (*Zeitsch. Chem. Ind. Kolloide*, 1910, 7, 301—304).—An expression is deduced for the viscosity of a system consisting of finely divided solid particles suspended in a liquid medium. If η is the viscosity of the liquid medium, η' that of the suspensoid, and f is the ratio of the volume occupied by the solid substance to the total volume, this may be written : $\eta' = \eta(1 + 9f/2)$. According to this, the increase in viscosity due to the suspended solid is determined by the percentage amount of this, and is independent of the degree of dispersion.

Since many colloidal substances reduce the viscosity of water to a much larger extent than that which would be expected according to this formula, it follows that the disperse phase in such systems is not present in the solid state. It is also improbable that the observed reduction in viscosity can be accounted for on the assumption that the disperse phase consists of liquid particles. The nature of these highly viscous emulsions or emulsoids appears to be determined by another factor which prevents the free motion of the disperse phase assumed in the deduction of the above formula for the viscosity. H. M. D.

Absorption of Carbon Dioxide and Sulphur Dioxide by Caoutchouc and by Blood Charcoal. ALBERT REYCHLER (*J. Chim. Phys.*, 1910, 8, 617—629. Compare *Abstr.*, 1910, ii, 272).—The absorption of carbon dioxide or sulphur dioxide by fine Para sheet (presumably not vulcanised) follows the linear law characteristic of simple solution phenomena. If C and c are the number of mols. of either oxide per kilo. of caoutchouc and per litre of gas respectively, the ratio C/c is a constant.

Carbon dioxide is rapidly absorbed at 20° , and the value of C/c is 1·06. Sulphur dioxide at $18\cdot5^\circ$ is much more soluble, the value obtained, $C/c = 25\cdot8$, being in good agreement with that previously given by the author, namely, 26·0 at 18° . The figures obtained by Chappuis (1883) at 0° also support the solution theory, the constant C/c having the value 38·5. Although Wo. Ostwald has suggested that these results are equally in accord with an adsorption formula, $C = \text{const.} \times c^{1/m}$, the author prefers to suppose that the exponent is 1·00 instead of 1·02, and that there is no indication of adsorption.

The blood charcoal used was the commercial product, which was not calcined, but was exposed in a vacuum for some time before use. The value of C/c with carbon dioxide at 20° is sufficiently constant (about 4·4) to justify the suggestion that the relation of the charcoal to the gas is that of a solvent.

In the case of sulphur dioxide, however, a complication arises from the fact that the absorption of this gas by the uncalcined charcoal is accompanied by the liberation of carbon dioxide and sometimes water vapour. The absorption equation is of the form $C = A + m.c$, where A and m are constants depending on the concentration of the gas. The constant A is supposed to be a measure of the amount of a chemical

change whereby combined carbon dioxide is replaced by combined sulphur dioxide, and the constant m is the solution constant; thus m increases with the concentration of the sulphur dioxide, whereas m decreases. A quantitative verification of the hypothesis is not possible in view of the unknown character of the chemical compounds in question, and the secondary influence which the compounds may exert on the solubilities.

It is supposed that the charcoal used was already chemically saturated with carbon dioxide, so that the further absorption of this gas followed a simple solution law.

R. J. C.

Adsorption Experiments with Varying Degree of Dispersion of the Adsorbent. KNUD ESTRUP (*Zeitsch. Chem. Ind. Kolloide*, 1910, 7, 299—301).—The adsorption of potassium permanganate by precipitated barium sulphate has been investigated.

Solutions of barium chloride and potassium sulphate were prepared of such a strength that 10 c.c. of each, when mixed together, gave one gram of barium sulphate. In one series of experiments, 10 c.c. of the potassium sulphate solution were diluted with water and a solution of potassium permanganate to 90 c.c. before addition of the equivalent quantity of the barium chloride solution. With increasing concentration of the potassium permanganate, the amount of this adsorbed increases, and the relationship between the adsorbed and dissolved amounts of permanganate is that required by an exponential formula.

In a second series, the potassium sulphate solution (10 c.c.) was diluted with water and permanganate solution in such a way that the concentration of the permanganate was constant, although the total volume varied from 50 c.c. to 500 c.c. These solutions were then mixed with corresponding solutions of barium chloride, in which the original 10 c.c. had been diluted with water until the total volume amounted to from 50 c.c. to 500 c.c. With precipitation under these conditions it was found that the amount of permanganate adsorbed by one gram of barium sulphate diminishes at first with increasing dilution, and then increases. The minimum adsorption corresponds with solutions which are approximately $N/18$.

In a third series similar to this, the permanganate was not added until five minutes after precipitation of the barium sulphate. A similar influence of concentration is found in these circumstances, but the adsorbed quantities are, of course, much smaller.

II. M. D.

Dissociation of Iodine Vapour. GUNNAR STARCK and Max BODENSTEIN (*Zeitsch. Elektrochem.*, 1910, 16, 961—966).—The iodine is heated in a large quartz glass bulb connected by a capillary tube to a quartz glass manometer on the principle of the Bourdon gauge. The bulb is heated uniformly by means of a specially arranged electric furnace, and the temperature is measured by a thermocouple placed inside the bulb. Measurements are made at four concentrations of iodine vapour, and at temperatures from 800° to 1200° . The mean values of the equilibrium constant $K^1 = p_{I_2}/p_{I_2}$ (the pressures being expressed in atmospheres) are: at 800° , 0·0114; at 900° , 0·0174; at 1000° , 0·165; at 1100° , 0·492; at 1200° , 1·23. By means of the equation $d \log K/dT = - U/RT^2$, the heat of the reaction $2I = I_2$

calculated. The mean value (at constant pressure) is 36,860 cals. Taking the molecular heat at constant pressure of monatomic iodine as 5 and that of iodine molecules as $6\cdot5 + 0\cdot0038T$, the heat of reaction $Q = 35480 + 3\cdot5T - 0\cdot0019T^2$, 35480 being the value at absolute zero. Introducing these values into Nernst's equation gives $\log K^1 = -7762/T + 1\cdot75\log T - 0\cdot000416T + 0\cdot422$. The values of K^1 calculated from this equation agree very closely with those found experimentally. Brill (Abstr., 1907, ii, 233) had previously found an entire lack of agreement between the requirements of Nernst's theory and Victor Meyer's measurements of the dissociation of iodine.

The value of the chemical constant of iodine atoms (taking that of iodine molecules as 4) is 2·2, which, with the exception of hydrogen, is the lowest value yet observed.

T. E.

The Capillary Rise of Salts. ZDENKO H. SKRAUP, A. VON BIEHLER, R. LANG, E. PHILIPPI, and J. PRIGLINGER (*Monatsh.*, 1910, 31, 1067–1158. Compare Abstr., 1910, ii, 934).—When experiments with very dilute solutions are carried out in closed vessels, there is always a slight deposit of dew on the interior of the vessel, showing that the dilute solutions in the strips of filter paper possess a higher vapour pressure than the solution itself.

Experiments with water alone showed that the paper is less moist in the upper layers than in the lower; this could also be seen to be the case with solutions, but no definite evidence could be obtained to show that the concentration of the solution was different at different heights.

Paper containing ash is more adsorbent than ashless paper, the increased adsorbing power not being due to chemical processes, but rather to some mechanical influence of the ash. Restoring the ash to a paper which has been washed free from it restores the original adsorbing power.

Rise in temperature diminishes the times necessary for the capillary rise to become complete, and also slightly increases the adsorption. The ordinary variations in room temperature have practically no effect on the adsorption.

Addition of indifferent substances to a solution has an effect on the time taken by the solute to rise and also on the height attained. With mixtures of alcohol and water the time of rise is greatest for the mixture showing the greatest contraction. The rise of the solute is affected in different ways by the addition of alcohol; it is not appreciably altered in the case of acids and salts, but considerably diminished in the case of the basic hydroxides, the diminution being the greatest in mixtures containing about 50% of alcohol. Glycerol behaves similarly to alcohol, except that it increases the rise of sodium hydroxide.

Salts may be divided into two chief classes. The salts of the first class comprise those of the alkalis and alkaline earths, and rise to almost the same height as the water; those of the other class rise much lower than the water, for example, 40 mm. as compared with 100 mm.

In the following summary all the results refer to experiments in air saturated with water vapour.

Salts of the First Class.—The capillary rise is independent of the

concentration of the solution, as proved by experiments with potassium and ammonium iodide, potassium ferro- and ferri-cyanide, potassium nitrate, sodium nitrite, and various chromates of the alkali and alkaline-earth metals. A remarkable phenomenon in connexion with these salts is that their concentration in the upper zone of the filter paper is three or four times greater than the concentration of the solution, and greater than in the lower zones of the filter paper. With potassium cyanide, as also with the alkali carbonates, borax, and sodium phosphate, increase in dilution diminishes the rise, so that salts which are appreciably hydrolysed are also adsorbed.

Valency, or atomic weight of the metal, has in itself no influence on the time of rise, which depends rather on the general chemical character of the salt. Lithium salts show themselves more closely related to the alkaline-earth metals than to the alkali metals.

Salts of the Second Class comprise those of the heavy metals and of aluminium. The capillary rise decreases with the dilution. Cations of similar nature rise to the same height, for example, ferro-, manganese-, cobalto-, nickel-, zinc and cadmium ions, ferri- and aluminium ions. Cations of the same metal, but with different valencies, show different rises; with iron and corium the ion of lesser valency shows the greater rise, whereas with tin the opposite holds good. In general, the anion has no great influence on the height to which the cation rises, but with the acetates of copper, lead, silver, and iron, the anion rises higher, and the cation lower, than is the case with the sulphates, chlorides, and nitrates.

In many cases the anion and cation have practically the same rise, and, in general, the anion in the salt rises higher than the same anion in the acid. In ferric, aluminium, and tin salts, the capillary rise of the anion is the same as for the free acids, but it cannot be assumed that this is due to complete hydrolysis at the dilutions used, unless it is assumed at the same time that the condition of a solution in capillary vessels is different from what it otherwise is. In chromium salts the anion rises lower and the cation higher than is the case with the corresponding iron and aluminium salts, which is in agreement with the fact that chromium readily forms complex salts. Owing to the strong hydrolysis of both stannous and stannic salts, the cations show the same rise. In the case of ceric nitrate, the filter paper shows two zones containing cerium, separated by a zone from which cerium is almost completely absent.

The cation of copper ammonia sulphate rises much lower than the cupric ion, whereas the complex ions in potassium ferric oxalate and malonate rise higher than the ferric ion in ferric oxalate, as does also the complex ion of potassium silver cyanide compared with the silver ion. Chromium nitrate and chromiumhexamine nitrate behave similarly, whereas blue chromium chloride, hexa-aquochromichloride, and green chromium chloride show considerable differences with respect to the rise of the anion.

With the complex ammonia compounds of cobalt and platinum, in some cases considerable differences in constitution had very little effect on the capillary rise, whereas in other cases slight differences in constitution had a considerable influence.

Experiments on the influence of one salt on the capillary rise of another show that no conclusions can be drawn as to the existence of double salts in solution; the mutual influences are very variable.

Strong acids are not influenced by the addition of alkali salts, whereas the capillary rise of the alkali hydroxides is diminished. The capillary rise of salts of the heavy metals is increased by the addition of the corresponding acids, whereas that of the acid is hardly affected by the addition of the salt.

T. S. P.

Piezoechemical Studies. VII. Influence of Pressure on Solubility. ERNST COHEN, KATSUJI INOUYE, and C. EUWEN (*Zeitsch. physikal. Chem.*, 1910, **75**, 257—304).—The measurements were made by the method already described (compare Cohen and Sinnige, Abstr., 1909, ii, 796) slightly modified in certain details, and an accuracy of 0·03 per cent. is claimed for the results. The solubility of sodium chloride at 24·05°, in grams per 100 grams of water, under different pressures is as follows: 35·90, 36·25, 36·55, 37·02, 37·36 at 1, 250, 500, 1000, and 1500 atmospheres respectively. For mannitol, at the same temperature, the results are as follows: 20·66, 20·92, 21·14, 21·40, and 21·64 grams at 1, 250, 500, 1000, and 1500 atmospheres respectively.

G. S.

Solutions from the Point of View of General Dynamics. I. E. VOLCHONSKY (*J. Russ. Phys. Chem. Soc.*, 1910, **42**, 1194—1197).—A theoretical and mathematical discussion of the question. Z. K.

Solutions. REGINALD O. HERZOG (*Zeitsch. Elektrochem.*, 1910, **16**, 1003—1004).—Setting out from a relationship found by Einstein (*Ann. Physik.*, 1906, [iv], **19**, 303), according to which $D = RT/(6\pi N\eta\rho)$, where D is the diffusion coefficient, η the viscosity of the solvent, ρ the diameter of a dissolved molecule, and N the number of actual molecules in a gram-molecule of a perfect gas, the author eliminates ρ by assuming that the dissolved substance occupies the same volume as it does when solid. Calling the volume of one gram of the solid v , and supposing that when dissolved it yields n molecules of molecular weight M , he finds $M = 4\pi N\rho^3/3v$. Eliminating ρ from these equations and putting in the values of the constants at 20°, using $N = 7 \cdot 05 \times 10^{23}$, he obtains $M = 11 \cdot 64/D^3v$. The molecular weights of a number of sugars calculated by this formula from their diffusion coefficients in aqueous solution are in surprisingly close agreement with the real values. The molecular weight of albumin is found to be 73,000. The diffusion coefficient of an electrolyte is connected with the mobilities of its ions by the formula $1/D = (1/u + 1/v)/2RT$; introducing this value of D into the above equation for aqueous solutions of acids at 25°, $u\sqrt{Mv} = 117$; for ten acids the actual values vary from 122 to 149.

T. E.

Solubility of Gases in Aqueous Solutions of Glycerol and of isoButyric Acid. KARL DRUCKER and E. MOLES (*Zeitsch. physikal. Chem.*, 1910, **75**, 405—436).—An apparatus suitable for determining the solubility of slightly soluble gases, and also for using small quantities of solvent, is described. The solubility of hydrogen and of nitrogen in mixtures of isoButyric acid and water, and of glycerol and

water, has been measured at 25°. The ratio of the solubility of hydrogen in water and in glycerol is 6:1; for nitrogen the ratio is 8:1.

In connexion with the solubility measurements in glycerol-water mixtures, other properties of this binary system, such as the total vapour-pressure curve, the density, refraction, viscosity, specific heat, and heat of mixing, have either been determined directly or are taken from the work of previous observers. The proper methods for comparing the results are fully discussed, and it has been found most satisfactory to express the concentrations in parts by weight, and to compare the deviations between the experimental curve and that represented according to the mixture rule (the latter being, of course, a straight line) by drawing perpendiculars from the former on the latter as shown in detail in the paper. The above method brings out the analogies in the curves for different physical properties.

In the case of the water-isobutyric acid system, the solubility of the gases does not deviate greatly from Henry's law in the region where the mixture is opalescent.

G. S.

Growth of Crystal Spheres. D. N. ARTEMÉEFF (*Zeitsch. Kryst. Min.*, 1910, **48**, 417—433).—A review is given of the literature on the growth and regeneration of damaged and broken crystals. Spheres were cut from crystals of various soluble salts, and these were suspended in saturated solutions of the same salt. The drusy, crystalline growths which formed on the surface were examined on the goniometer, and the crystal forms observed are recorded.

L. J. S.

The Rate of Dissolution of Selenite at Different Crystalline Surfaces. STANISŁAW TÓŁOCZKO (*Bull. Acad. Sci. Cracow*, 1910, 209—218).—The apparatus used in these experiments was that previously employed by Bruner and Tółoczko (*Abstr.*, 1907, ii, 935), and measurements of the rate of dissolution were made at the three surfaces (010), (110), and (111). In the case of each surface, the rate of dissolution is found to be a linear function of the velocity of flow of the solvent over the surface of the crystal. The actual rate of dissolution varies with the crystallographic nature of the surface, but the relative rates are practically independent of the flow of solvent. The relative dissolution velocities v_{010} , v_{110} , and v_{111} are represented by 1:1.76:1.88.

Experiments were also made to ascertain whether the differences in the rates of dissolution at the different surfaces are due to differences in solubility or to variations in the thickness of the diffusion layer. With this object a crystal of selenite of known weight and dimensions was introduced into a solution saturated by exposure to the surface (010). The solution, provided with stirring apparatus, was immersed in a thermostat at 25° for a period of two months. At intervals the weight and dimensions of the small complete crystal and the electrical conductivity of the solution were determined, but no definite changes were observed. It appears, therefore, that the differences in the rates of dissolution are not due to differences in solubility.

H. M. D.

The Rates of Growth and Dissolution of Crystals in Relation to the Reversibility of these Processes. STANISLAW TOLLOCZKO and J. TOKARSKI (*Bull. Acad. Sci. Cracow*, 1910, 219-234. Compare preceding abstract).—Measurements have been made of the rate at which crystals of copper sulphate increase in size when brought into contact with slightly supersaturated solutions, and of the rate at which dissolution takes place in contact with solutions containing somewhat less of the dissolved salt than that corresponding with saturation. The method employed was similar to that which has been used in previous investigations of this nature, and separate sets of observations were made for the two crystalline surfaces (110) and (110).

The rate of dissolution as well as that of crystallisation varies considerably with the surface examined. For the surface (110) the rates of dissolution and crystallisation under comparable conditions are equal, and this indicates that the processes are strictly reversible. On the other hand, the rate of dissolution is much greater than the rate of crystallisation in the case of the surface (110), and microscopic examination of the dissolving surface has shown that this is probably due to the fact that irregular etching takes place when dissolution occurs. No irregularities of this nature were observable in the case of the surface (110).

The cause of the difference in the rates of the dissolution and crystallisation processes at different surfaces is examined, and the conclusion is drawn that this is due to variations in the thickness of the diffusion layer at these surfaces.

H. M. D.

Solid Colloidal Systems in Metallography. CARL BENEDICKS (*Zeitsch. Chem. Ind. Kolloide*, 1910, 7, 290-299).—A summary is given of the author's views relating to the nature of the different micrographic structures which are found in iron carbon and iron nickel alloys. Troostite is said to represent a solid colloidal solution of cementite in ferrite, and as such it approximates more closely to perlite than to martensite in its properties. Similar colloidal systems are probably formed in other technical alloys, and evidence in favour of this is cited in the case of iron nickel alloys.

In opposition to von Weimarn, the author maintains that all solid solutions cannot be regarded as of the colloidal type, but that true solid solutions, in which the dispersity is of molecular character, are also capable of existence. Martensite is cited as an example of such a solution, and as such it differs widely from colloidal troostite.

H. M. D.

Equilibrium between Two Substances in a Mixed Binary Solution. VIII. E. VOLCHONSKY (*J. Russ. Phys. Chem. Soc.*, 1910, 42, 1180-1194. Compare *ibid.*, 1909, 41, 1763).—The equations $P = R(p-m)/(q-n) - R(x_c)$ and $P_1 = R'(x_c) - R'(m-p)/(n-q)$ previously deduced are incorrect, and the correct forms are now shown to be $P = [R(p-m)/(q-n) - R(x_c)(p-m)](n-q)$ and $P_1 = [(m-p)/(n-q)]R[(m-p)/(n-q) - R_{\infty} + x_{1c}[R_{\infty} - Rx_{1c}]](n-q)$. These equations might be simplified by assuming that for the system $\text{BaSO}_4-\text{H}_2\text{SO}_4-\text{H}_2\text{O}$ the maximum work of the process is equal to the heat effect, that is, $A = u$.

in the general thermo-dynamic equation $A - u = T.dA/dT$, but calorimetric experiments of the heat of decomposition of the acid barium sulphates, $\text{BaSO}_4 \cdot (\text{H}_2\text{SO}_4)_2 \cdot \text{H}_2\text{O}$ and $\text{BaSO}_4 \cdot \text{H}_2\text{SO}_4$, do not agree with those calculated from such equations.

At the ordinary temperature the solid phase of solutions containing 87.36% and 92.48% sulphuric acid respectively has the composition in each case, $\text{BaSO}_4 \cdot (\text{H}_2\text{SO}_4)_2 \cdot \text{H}_2\text{O}$, but at 93° the solid phase at the lower concentration consists of 94.94% BaSO_4 , that of the higher concentration consists of 68.16% BaSO_4 and 31.26% H_2SO_4 , the salt being anhydrous and crystallising in needles. As the temperature rises so the solubility of the compound $\text{BaSO}_4 \cdot (\text{H}_2\text{SO}_4)_2 \cdot \text{H}_2\text{O}$ increases, whilst that of the salt $\text{BaSO}_4 \cdot \text{H}_2\text{SO}_4$ decreases. The curve for the three solid phases BaSO_4 , $\text{BaSO}_4 \cdot \text{H}_2\text{SO}_4$, $\text{BaSO}_4 \cdot (\text{H}_2\text{SO}_4)_2 \cdot \text{H}_2\text{O}$ is given. The temperature of decomposition of the last salt is about 53°, and its transformation into $\text{BaSO}_4 \cdot \text{H}_2\text{SO}_4$ and into BaSO_4 are both endothermic reactions. The compound $\text{BaSO}_4 \cdot \text{H}_2\text{SO}_4$ decomposes at about 158–160°, and its transformation into BaSO_4 is also an endothermic reaction.

Z. K.

Binodal Curves, Plait Points, and Tie Lines in Fifty Systems, each Consisting of Water and Two Organic Liquids. WALTER D. BONNER (*J. Physical Chem.*, 1910, 14, 738–789).—Mixtures of water with a hydrocarbon, halogenated hydrocarbon, ether, ester, etc., were examined in conjunction with methyl, ethyl, and propyl alcohols and acetone as consolutes.

Bancroft's method of quantitative synthesis from pycnometers was adopted in order to obviate analyses. The consolute was added drop by drop to the stirred mixture contained in a long narrow tube at 0° until it became homogeneous as observed through a cathetometer telescope. In some cases the effect of the consolute was accentuated by addition of lamp-black, which floated at the surface of separation until homogeneity was attained.

For tie line determinations, the phases were allowed to separate or were separated by centrifuge, and their volumes, subject to correction for meniscus, were read off on the cathetometer. Tie lines and plait points (critical points) were determined by Lash Miller and McPherson's graphic method (*Abstr.*, 1909, ii, 132). By these means a very extensive survey of the field was rapidly obtained, accurate to within a few per cent.

Rectangular co-ordinates are used instead of the more usual triangular diagram. The co-ordinates of the plait points show a certain stoichiometric regularity. With alcohol as consolute, ethyl acetate, propionate, and isobutyrate fall into their natural sequence, as do the higher alcohols, hydrocarbons, and alkyl bromides. On passing from methyl to ethyl and propyl alcohol as consolute, the plait point travels further from the 100% water ordinate. The positions of the binodal curves, however, exhibit no regularity.

The systems hexane–*w*-ter-carbinol and heptane–water–carbinol exhibit the peculiarity that the plait point is practically at the origin of co-ordinates, from which the tie lines therefore radiate. This indicates that when two phases are present, the upper phase consists of

practically pure hydrocarbon, although the aqueous lower phase may also contain a considerable proportion of hydrocarbon.

Bancroft's exponential formula for the equilibrium in these systems has been tested by plotting the author's results in logarithmic co-ordinates.

In nineteen cases the formula holds, as a straight line graph is obtained. Of the remainder, twenty-five give concave or convex graphs and six irregular curves. In the nineteen cases which give a straight line, the meaning of the various constants in the exponential formula is discussed.

R. J. C.

General Phase Rule and its Application to Systems of Capillary Chemistry. P. N. PAWLOFF (*J. Russ. Phys. Chem. Soc.*, 1910, 42, 1034—1061).—The application of the phase rule to various disperse systems which belong to the domain of capillary chemistry is discussed from a theoretical and mathematical point of view. For the results obtained, the original must be consulted.

Z. K.

Supersaturation Theory of Certain Apparently Rhythmic Reactions. RAPHAEL E. LIESEGANG (*Zeitsch. physikal. Chem.*, 1910, 75, 371—372).—To Ostwald's view that the formation of concentric rings of silver chromate when silver nitrate diffuses into a gelatin film containing potassium dichromate is due to supersaturation phenomena, the objection has been raised that it is incompatible with the fact that two systems of concentric rings can be formed successively without apparent interference. This objection is now shown to have no weight, as the two systems of rings are at different levels in the gelatin film. Ostwald's view is further supported by the observation that a single salt, for example, trisodium phosphate, can be obtained crystallised in concentric rings in a gelatin film.

G. S.

Mechanism of Irreversible Phenomena. RENÉ MARCELIN (*Compt. rend.*, 1910, 151, 1032—1055).—The author develops the equation:

$$\frac{dN}{dt} = M \left(e^{-\frac{1}{RT} \cdot \frac{d\psi_1}{dN}} - e^{\frac{1}{RT} \cdot \frac{d\psi_2}{dN}} \right)$$

to express the speed at which an unstable system reaches a condition of equilibrium. e , t , R , and T have their usual significance; considering the speed of transformation as the resultant of the rate of evolution of two systems in contrary directions, ψ_1 and ψ_2 express the available energy of the two systems, whilst N is a variable indicating the degree of transformation (for example, the number of molecules of a superposed liquid transformed into crystals).

It is shown mathematically that the above expression is in accordance with the known laws for speed of crystallisation and for reactions in a homogeneous medium. The factor M depends on temperature, and will be determined experimentally.

W. O. W.

Reactions in Heterogeneous Systems. The Influence of Alcohol. KASIMIR JABĘCZYŃSKI and ST. JABLONSKI (*Bull. Acad. Sci. Cracow*, 1910, 287—294).—Experiments have been made to determine the influence of alcohol on the rate at which solid substances are acted on by aqueous solvents. The heterogeneous reactions examined were

the rate of dissolution of magnesium and of calcium carbonate (in the form of marble) in dilute hydrochloric acid. When a portion of the water in the acid solution is replaced by alcohol, the rate of dissolution of the solid is in both cases retarded, and the retarding influence is found to be of the same magnitude as that found for the influence of alcohol on the rate of diffusion of electrolytes in aqueous solution. This result is interpreted in favour of the view that the velocities of reactions in heterogeneous systems are determined primarily by the rates of diffusion processes. II. M. D.

Dynamics of the Reaction between Alcohol and Sulphuric Acid. A Correction. ROBERT KREIMANN (*Monatsh.*, 1910, 31, 1031—1033).—A correction of an error of calculation (Abstr., 1910, ii, 700). T. S. P.

Kinetics of the Formation of Methyl Hydrogen Sulphate and of Methyl Ether. ROBERT KREIMANN and H. NEUMANN (*Monatsh.*, 1910, 31, 1051—1056).—An investigation of the velocity of formation of methyl hydrogen sulphate from methyl alcohol and sulphuric acid, and of methyl ether from methyl hydrogen sulphate and methyl alcohol. The measurements and calculations were made in a manner similar to that described for the corresponding ethyl compounds (Abstr., 1910, ii, 700, 945).

The velocity of formation of methyl hydrogen sulphate is much greater than that of ethyl hydrogen sulphate, whereas the temperature quotient, determined from experiments at 40° and 50°, is somewhat smaller, namely, 2.6 instead of 3.0. The velocity constants are satisfactory, and are the greater the higher the concentration of the sulphuric acid used.

The constants calculated from the experiments on the velocity of formation of methyl ether decrease very considerably during the course of the reaction, owing to the retarding effect of the water produced (compare with ethyl ether). T. S. P.

Velocity of Saccharification of Starch. II. HENRI VAN LAER (*Bull. Acad. roy. Belg.*, 1910, 707—718. Compare Abstr., 1910, ii, 839).—The results recorded by Brown and Glendinning (*Trans.*, 1902, 81, 388) and V. Henri (*Lois générales de l'action des diastases*, Paris, 1903), which respectively negative and affirm the view that the hydrolysis of starch by diastase takes place in accordance with the logarithmic law, are considered critically, and it is shown that the discrepancy between them is not due to (a) difference in temperature at which the experiments were made, (b) nature of the diastase used, or (c) difference in the limit of hydrolysis found.

It is further shown that the limit of hydrolysis reached depends on the activity, and, therefore, on the quantity of diastase used, and is less for starch yielding an opalescent mucilage than for soluble starch giving a limpid mucilage, such as that prepared under pressure as described previously (*loc. cit.*). T. A. H.

Inversion of Menthone. CARL TUBANDT [with K. MOHS, W. TUBANDT, and H. WEINHAUSEN] (*Annalen*, 1910, 377, 284—314. Compare Abstr., 1905, ii, 424; 1907, ii, 670).—The work on the

inversion of menthones by various acids in different solvents has been repeated and extended. As traces of water have an appreciable effect on the rate of inversion, the alcohols and other solvents were dehydrated by means of calcium.

The experiments with sulphosalicylic acid have been repeated; in each case an acid was used which had been completely dehydrated by continued heating at 80° until the constant for the acid had reached its maximum.

The following values were obtained for sulphosalicylic acid at 20°, where c = molar concentration of the catalyst, and K = value for $K + K_1$ (compare Abstr., 1907, ii, 671):

Ethyl Alcohol	c	0·1	0·05	0·025	0·01	0·005
	K	292	126	53·8	19	7·8
isobutyl Alcohol	c		0·05	0·025	0·0125	
	K		139	60·6	26	

With ethyl alcohol and benzene (90% by volume), $c = 0·025$, $K = 29·3$.

These results show that with $c = 0·01$, hydrogen chloride is about eight times as efficient as sulphosalicylic acid, although as catalysts in the process of esterification the two acids have much the same value (Goldschmidt and Udby, Abstr., 1907, ii, 853).

With sulphosalicylic acid, as with hydrogen chloride, the rate of inversion increases more rapidly than the concentration of the catalyst. The addition of benzene to ethyl alcohol diminishes the rate of inversion, whereas when hydrogen chloride is used the addition of benzene facilitates inversion.

Inversion under the influence of acid is influenced to a marked extent by traces of moisture, but moisture has but little effect when bases are used. The following values are given:

Hydrogen chloride at 20°: Ethyl alcohol, $c = 0·01$, aq. = 0·1, depression of $K + K_1 = 32\%$; isobutyl alcohol, $c = 0·005$, aq. = 0·01, depression = 36%; $c = 0·005$, aq. = 0·005, depression = 72%; ethyl alcohol and benzene (90%), $c = 0·005$, aq. = 0·01, depression = 36%.

Sulphosalicylic acid at 20°: Ethyl alcohol, $c = 0·1$, aq. = 0·01, depression = 40%; $c = 0·05$, aq. = 0·01, depression = 39%; $c = 0·05$, aq. = 0·05, depression = 75%; $c = 0·05$, aq. = 0·2, depression = 91%; $c = 0·025$, aq. = 0·01, depression = 40%; $c = 0·025$, aq. = 0·05, depression = 75%; isobutyl alcohol, $c = 0·05$, aq. = 0·01, depression = 41%; $c = 0·05$, aq. = 0·05, depression = 77%; ethyl alcohol and benzene (90%), $c = 0·025$, aq. = 0·01, depression = 43%.

The effects of small amounts of water are thus much more marked than in the case of esterification (Goldschmidt and Udby, *loc. cit.*; Kailan, Abstr., 1906, ii, 659; Lapworth, Trans., 1908, 93, 2187), and it is suggested that the most accurate method of estimating small amounts of water in various solvents is by determining the rate of inversion of menthone in the solvent. The effect of moisture is the more marked in the case of isobutyl alcohol than in that of ethyl alcohol, and the effect of a given quantity of water appears to be independent of the concentration of the catalyst.

The addition of small amounts of alcohol to indifferent solvents

increases to an appreciable degree the rate of inversion when acid catalysts are employed; thus the addition of 0·1 mol. of methyl alcohol to a 0·005*N*-solution of hydrogen chloride in benzene raises the constant some ten times. Different alcohols have much the same effect when 0·1 mol. is added, but when mixtures of benzene and 1 vol. % of the alcohol are used, the effects are the more pronounced the smaller the mol. wt. of the alcohol. With increasing amounts of alcohol the rate of inversion is increased rapidly, until a well-defined maximum is reached at 3%, and the addition of more alcohol produces a lowering of the constant—a lowering which is at first rapid, but gradually slows down.

It has been shown already (Abstr., 1907, ii, 673) that the addition of chlorides increases the catalytic power of hydrogen chloride. This has been confirmed; perfectly anhydrous lithium chloride, aniline hydrochloride, and calcium chloride all produce an acceleration both in anhydrous alcohol and in alcohol containing small amounts of water. The effect is the more marked the greater the concentration of the salt; thus, with 0·01*N*-hydrogen chloride, $K + K_1 = 0\cdot0147$, with 0·002*N*-lithium chloride this is raised to 0·0157, and with 0·05*N*-lithium chloride to 0·0233. The addition of anhydrous aniline sulphosalicylate, on the other hand, retards the inverting action of sulphasalicylic acid in ethyl-alcoholic solution. In the case of the chlorides, it is found that the presence of an appreciable amount of a salt tends to diminish the retarding effects of small amounts of water, a result which may be due to combination between the salt and the water. The addition of mercuric chloride to the hydrogen chloride solution lessens the inverting power of the acid, for example, with 0·01*N*-hydrogen chloride the constant is 0·0147, and this is reduced by 0·1*N*-mercuric chloride in absolute ethyl alcohol to 0·0023, and a similar diminution is noticed when aqueous alcohol is used (compare Le Blanc and Noyes, Abstr., 1891, 388).

The following table gives the values of the temperature-coefficients:

Solvent.	Catalyst.	K_{30}/K_{30}	K_{20}/K_{20}
Ethyl alcohol	0·01 <i>N</i> to 0·03 <i>N</i> -EtONa	2·38	2·57
Ethyl alcohol + water (40 vol. %)	0·02 <i>N</i> -EtONa	2·31	2·18
Ethyl alcohol + benzene (60 vol. %)	0·02 <i>N</i> -EtONa	2·37	2·95
Ethyl alcohol + benzene (90 vol. %)	0·01 <i>N</i> -EtONa	2·99	3·29
Ethyl alcohol + ether (80 vol. %)	0·01 <i>N</i> -EtONa	2·69	2·98
a butyl alcohol	0·01 <i>N</i> -EtONa	2·53	--
w <i>i</i> alcohol.....	0·01 <i>N</i> -HCl	2·37	3·10
Ethyl alcohol + benzene (90 vol. %)	0·005 <i>N</i> -HCl	—	3·19
Ethyl alcohol.....	0·05 <i>N</i> -Sulphosalicylic acid —	—	3·09

Unlike most unimolecular reactions, the temperature-coefficient is small, and tends to diminish with rise of temperature. The relationship $\log K_1/K_0 = A T_1 - T_2/T_1 T_2$ holds good.

The view that in the case of acid catalysts the inversion is complicated by combination between the acid and ketone is supported by the fact that when the concentration of the acid is kept constant, the value of $K + K_1$ tends to decrease with the amount of ketone present. Further support is found in the fact that in the esterification of an acid by the hydrogen chloride catalytic method, the addition of a small amount of menthone to the mixture retards the process

of esterification, for example, the value of K_c (Goldschmidt and Uddy, *loc. cit.*) falls from 0·314 (ethyl alcohol without menthone) to 0·287 in the presence of 0·5 mol. menthone; similar results are obtained when methyl and *isobutyl* alcohols are used as solvents. J. J. S.

Intramolecular Transformations. V. Influence of the Solvent on the Velocity of Reaction and the Equilibrium. OTTO DIMROTH [and, in part, HEINRICH SCHNEIDER] (*Annalen*, 1910, 377, 127—163).—The author's ultimate goal in these researches is a position from which, not only the products of a reaction, but also their proportions can be predicted. In a simple substitutive or additive reaction, the isomerides which may be, but not those which actually are, produced can be predicted from the structural formula of the reacting substance; in order to foretell what isomerides actually are formed, it is necessary to know which of the concurrent reactions is the most rapid, and, if two or more isomerides are produced simultaneously, also to know the ratio of their velocities of formation. The velocity of reaction is not conditioned solely by chemical affinity; the course of a reaction is retarded by chemical resistances. Following Nernst, the author gives the relation—the velocity of reaction is the quotient of the driving force and the chemical resistance. Before this relation can be applied in a scientific manner, however, a large amount of pioneer work is necessary, and one of the first problems to be attacked is the influence of the medium on the course of a reaction.

The simplest, and therefore the most rational, method of procedure is the study of a unimolecular reaction. The author has examined the behaviour of methyl 5-hydroxy-1-phenyl-1:2:3-triazole-4-carboxylate and of its neutral isomeride, $\text{NHPH}\cdot\text{CO}\cdot\text{C}(\text{CO}_2\text{Me})\begin{smallmatrix} \text{N} \\ \parallel \\ \text{N} \end{smallmatrix}$ (*loc. cit.*), in methyl, ethyl and benzyl alcohols, ethyl formate, acetate and nitrate, acetonitrile, acetone, chloroform, and nitrobenzene, and has measured the solubilities at 10° of the two isomerides, and also k , the velocity constant of the transformation at 10°. The results show clearly that the opinion held previously, namely, that the velocity of transformation increases as the dielectric constant of the solvent diminishes, is no longer tenable. A new relation is established: the velocity of transformation of the aci- ("enol") modification is so much the smaller the greater the solubility of the aci-modification; in fact, the two quantities are approximately inversely proportional, for their product only varies from 0·1 to 0·32, whilst the solubilities vary from 218 grams (per litre) in methyl alcohol to 3·2 grams in ethyl nitrate, and the values of k vary from 0·00053 to 0·053.

In order to throw a clearer light on this dual rôle of the solvent, the influence of the latter on the state of equilibrium is considered. Attention is drawn to a little known relation deduced by van't Hoff from the law of mass action. This relation, which is applicable to two mutually interconvertible isomerides, whether tautomeric or desmotropic, in dilute solution, but does not apply to polymerides, is expressed by the equation: $C_a/C_b = G \cdot L_a/L_b$, where C_a and C_b are the concentrations of the two isomerides, L_a and L_b are their

solubilities, and G is a constant which is independent of the nature of the solvent, being equal to $K'p_b/p_a$, where p_a and p_b are the partial pressures, and K' the equilibrium constant of the two isomerides in the space above the solution. It follows from this relation that when G has been calculated from the equilibrium constant and the solubilities of a pair of isomerides in any suitable solvent, the state of equilibrium of the isomerides in any other solvents can be calculated from the solubilities of the two forms in these solvents.

Another relation of great importance is deduced from the preceding equation. A solution, saturated at a definite temperature with respect to each of two mutually interconvertible isomerides A and B , is in contact with the two solid phases. When $G = 1$, $C_a/C_b = L_a/L_b$, and the system is in equilibrium. When $G < 1$, then $C_a/C_b < L_a/L_b$; consequently A must change into B , which in turn must crystallise, more of A must dissolve, change into B , and separate as the latter, the result being that finally B is the only solid phase left. Conversely, when $G > 1$, A will be the solid phase left. Therefore under the conditions mentioned the direction of the transformation is determined by the value of G , and is quite independent of the nature of the solvent. This result is frequently contrary to experience. For example, Bamberger has shown that α -nitroformaldehydohydrazone is changed into the β -isomeride in aqueous or alcoholic solution, the converse change occurring in benzene, chloroform, or light petroleum. In such cases a partial or total polymerisation must have occurred, which would nullify the conditions on which the relation is based. The accuracy of van't Hoff's reasoning has been established by the author by means of a pair of isomerides which fulfil all of the conditions required in the preceding system. These isomerides are the neutral methyl (or ethyl) 5-amino-1-phenyl-1 : 2 : 3-triazole-4-carboxylate and the acidic methyl (or ethyl) 5-anilino-1 : 2 : 3-triazole 4-carboxylate. The latter can be titrated by potassium hydroxide in the presence of the former; the velocity of transformation, which is so small at the ordinary temperature or even at 50—60° that the solubilities of the two isomerides can be readily determined, is accelerated by an acid catalyst without disturbing the state of equilibrium. In ether, ethyl alcohol, toluene, benzene, nitrobenzene, or chloroform, the average value of G is 2·25 for the ethyl ester, and 0·34 for the methyl ester. In accordance with van't Hoff's deduction it is shown experimentally that, independently of the nature of the solvent, the residual solid phase is the neutral isomeride in the case of the methyl ester and the acid isomeride in the case of the ethyl ester. Moreover, no relation is obvious between the dielectric constants of the solvents and the equilibrium constants of either pair of isomerides.

Having shown that the equilibrium is dependent on the solubilities of the reacting substances, the author discusses the conclusion which can be drawn from this relation with regard to the connexion between the velocity of reaction and the solubility. At present it is only possible to state the relation: $k_b/k_a = GL_a/L_b$, where k_a and k_b are the velocity constants of the opposed reactions. How far the individual velocity constants are functions of the solubility of A and B cannot be stated from this indeterminate equation, but the k values must be

either inversely proportional to the solubilities of the reacting substances (that is, $k_a = h_1/L_a$ and $k_b = h_2/L_b$, where h_1 and h_2 are proportionality factors satisfying the relation $h_1/h_2 = G$), or directly proportional to the solubilities of the resulting substances (that is, $k_a = i_1 L_b$ and $k_b = i_2 L_a$, where again $i_2/i_1 = G$). von Halban assumes the latter relation in his experiments on the decomposition of triethyl-sulphonium bromide (*Abstr.*, 1909, ii, 722), but the author's experiments on methyl 5-hydroxy-1-phenyl-1 : 2 : 3-triazole-4-carboxylate, mentioned above, indicate that more probably the former relation represents the connexion between the velocity constants and the solubilities. Unfortunately, a pair of isomerides has not yet been found by which the equation $k_a = h_1/L_a$ can be experimentally tested and the constancy of h_1/h_2 in all solvents ascertained.

C. S.

Peculiar Relation between the Strengths of Acids and their Activity. PAUL RABE and ANDREW Mc MILLAN (*Ber.*, 1910, 43, 3308—3310).—The catalytic action of acids in accelerating the conversion

of cinchonine into cinchotoxine ($\begin{array}{c} \text{CH} \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{N} \\ | \\ \text{CH}_2 \end{array} \text{---} \begin{array}{c} \text{CH} \cdot \text{CH(OH)} \\ | \\ \text{CH}_2 \end{array}) \rightarrow \begin{array}{c} \text{CH} \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{NH} \\ | \\ \text{CH}_2 \end{array} \text{---} \begin{array}{c} \text{CH}_2 \cdot \text{CO} \cdot \\ | \\ \text{CH}_2 \end{array}$), has been examined by heating 9 grams of cinchonine, 108 c.c. of water, and five equivalents of an acid (hydrochloric, oxalic, tartaric, formic, phosphoric, succinic, and acetic) at 98° for definite times (eight, sixteen and a-half, and fifty hours), the amount of cinchotoxine produced being determined by extracting the cooled, basified mixture with ether, in which cinchotoxine is extremely soluble. It is found that the velocity of conversion diminishes as the dissociation constant of the acid increases. This remarkable result is receiving further attention.

C. S.

Auto-oxidisable Substances and Systems of Physiological Interest. I. and II. TORSTEN THUNBERG (*Skand. Arch. Physiol.*, 1910, 24, 90—93, 94—96).—The uptake of oxygen by commercial preparations of lecithin is much increased by the addition of ferric chloride. The same is true for cuorin. The action can be shown when the ferric chloride is diluted, so that only one part in six millions is present. Other metallic salts act similarly, but never so powerfully; copper, silver, and cobalt salts are, after iron, the most effective. The order of efficiency of the metals in this catalytic action is quite different in the case of linseed oil.

W. D. H.

Chemical Composition of Matter. III. EDUARD MULDER (*Rec. trav. chim.*, 1910, [ii], 14, 453—454. Compare *Abstr.*, 1909, ii, 34).—Supposing that units of matter may be condensed in their centres of gravity, A and B , at unit distance apart, and that their energy is also concentrated at the same points, whilst the mass and energy of the ether penetrating them is concentrated at points A' and B' at infinitely small distances from A and B respectively, experience shows that there would be attraction along AB . A difference of pressure at the points $A'A$ and BB' , that is, between ordinary matter

and ether must be admitted, as well as a mean intensity of energy. The problem to be solved is as to the transformations which take place before the attraction manifests itself. T. A. H.

Calculation of Molecular Dimensions from Radiometer Observations. P. DEBYE (*Physikal. Zeitsch.*, 1910, 11, 1115-1121).—In a recent paper (*Ann. Physik*, 1910, [iv], 32, 809), Knudsen has measured the pressures which are produced as a result of radiometer action between two parallel plates which are at different temperatures and are surrounded by a gas at low pressure. A formula was deduced, by means of which the observed radiometer pressures can be represented satisfactorily when the pressure of the gas is sufficiently small, but for higher pressures the calculated pressures are higher than those observed. The author shows that the divergences are probably due to the invalid assumption, that all the molecules which leave the hot plate reach the cold plate with velocities corresponding with the higher temperature. As a consequence of molecular collisions, a certain fraction of the molecules will not reach the cold plate in this condition. This fraction increases with the pressure of the gas, and is determined by the ratio of the distance between the plates to the free path of the molecules. A new formula, which takes this effect into account, has been deduced, and this is found to agree better with the experimental observations.

From the deviations between the observed pressures and those calculated by Knudsen's formula, the diameters of the gaseous molecules can be calculated. The values obtained for hydrogen and oxygen are 2.9×10^{-8} and 3.9×10^{-8} cm. respectively. These values are a little greater than those obtained from the constant b of van der Waals' equation. H. M. D.

The Attraction Constant of a Molecule of a Substance and its Chemical Properties. RICHARD D. KLEEMAN (*Phil. Mag.*, 1910, [vi], 20, 905-921).—In previous papers (compare *Abstr.*, 1910, ii, 932) an expression has been obtained for the force of attraction between the molecules of a liquid. This attractive force, which gives rise to surface tension and latent heat of vapourisation, is supposed to be the same as that which causes chemical combination. According to this, the attraction constant $\Sigma \sqrt{m}$, representing the sum of the square roots of the weights of the atoms in a molecule, should be related to the chemical properties of a substance.

Such relationships have been found in the case of a large number of organic substances. The values of $T_c/\Sigma \sqrt{m}$, in which T_c is the critical temperature, have been calculated, and it is claimed that the values of this factor are approximately constant for certain comparable series of compounds.

Other expressions, which do not involve the critical or other corresponding temperature, are similarly related to the chemical properties. Such are: $v/(\Sigma \sqrt{m})^4$, $\lambda/(\Sigma \sqrt{m})^4$, $E/(\Sigma \sqrt{m})^4$, $L/\Sigma \sqrt{m}$, and $p/(\Sigma \sqrt{m})^4$, where v is the molecular volume, λ the surface tension, E the potential energy of the surface film, L the latent heat of

vapourisation, and p the pressure of the saturated vapour corresponding with a temperature, T , which has the same value on the reduced scale for the different substances.

H. M. D.

Wash-bottle with Divided Liquid Layer. FRANZ MICHEL (*Chem. Zeit.*, 1910, 35, 1228).—An eprovette into the neck of which is ground a glass cap provided with inlet and exit tubes, the inlet tube being expanded at the lower part to a pipette-like form which fits the contracted part of the apparatus but loosely, leaving an annular space of 1—2 mm. When required for use, the cap is removed, and the required amount of the washing liquid introduced. The tube is then replaced; glass beads are now placed in the upper part of the bottle until they reach 2—5 cm. above the liquid, and the bottle is then closed. On passing a current of gas, the column of liquid is divided into two parts, as a gaseous space forms below the contracted part of the apparatus. The next gas bubbles are then forced through the narrow space, and pass through the interspace of the glass beads. The apparatus, therefore, serves the purpose of two separate wash-bottles. If it is desired to mix the two liquids, the passing of the gas is temporarily stopped, which causes the liquid to ascend into the inlet tube, and on again passing the gas, or by blowing through the tube, the two layers are re-formed.

L. DE K.

Lecture Apparatus for Demonstrating, by means of the Electric Arc, the Formation of Oxygenated Compounds from Atmospheric Air. HENRI VAN ERP (*Rec. trav. chim.*, 1910, [ii], 14, 447—452).—The apparatus is a small, triangular electric furnace, constructed in asbestos board, and provided with hollow copper electrodes, cooled by water circulating inside them. Air is caused to pass across the arc formed between the two electrodes, and is then passed through a wash-bottle containing a solution of potassium hydroxide, in which after a time the presence of nitrite and nitrate may be demonstrated. The method of constructing the apparatus is described in detail in the original, which also contains an illustration.

T. A. H.

Inorganic Chemistry.

Nature of the Decomposition of Hydrogen Peroxide by Light. A. TIAN (*Compt. rend.*, 1910, 151, 1040—1042).—By submitting solutions of hydrogen peroxide in conductivity water to the action of ultra-violet light from a quartz-mercury lamp, the author finds that the reaction for its decomposition is a unimolecular one, and proceeds in accordance with the equations : $H_2O_2 = H_2O + O$; $2O = O_2$. The decomposition by light therefore resembles that induced by catalysts, and is different from the decomposition by heat, which is a bimolecular reaction. Under the conditions of the experiment, the

reverse action occurred to an extent not exceeding the formation of 0.00005 gram of hydrogen peroxide per litre. W. O. W.

Catalytic Decomposition of Hydrogen Peroxide in a Homogeneous Medium. EUGEN SPITALSKY (*J. Russ. Phys. Chem. Soc.*, 1910, 42, 1085—1159*).—A discussion of the nature of catalysis, in which it is shown that the velocity and, to some extent, the direction of all oxidising-reducing actions, and particularly that of hydrogen peroxide, are greatly affected by the concentration of the hydrogen ions of the reacting mixture, and that the condition of the latter at any given moment, and whatever the concentration of the hydrogen ions, can be completely defined by the effective concentration of the hydrogen peroxide at that moment. In the catalysis of hydrogen peroxide by dichromate there is a simultaneous reversible formation of various intermediate compounds of varying stability, of which those having the least number of molecules of the hydrogen peroxide attached to the catalyst are comparatively less stable; hence, towards the end of the reaction when the concentration of hydrogen peroxide is less, the velocity of the reaction is greatest.

The measurements were made gasometrically, the experiments being performed in Bredig and Walton's apparatus (*Abstr.*, 1903, ii, 282), and Riesenfeld and Weich's criticisms (*Abstr.*, 1908, ii, 951) of the gasometric method are shown to be entirely without foundation.

Many of the results have already been published (*Abstr.*, 1907, ii, 338, 942).

Since chromic acid or the dichromate in acid solution is reduced by hydrogen peroxide to chromic oxide, it was necessary, in order to complete the experiments on the catalytic decomposition of hydrogen peroxide by chromates, to investigate how far this process occurs in the catalytic experiments described, and what is its relation to the activity of the catalyst. In very dilute solutions all the best ordinary methods for the estimation of chromic acid are wholly inapplicable, but the following very accurate and convenient method is employed. To about 10 c.c. of a solution containing 0.0108 mol. CrO_3 , 30 c.c. of sodium hydrogen arsenate solution containing 0.004 gram-mols. NaH_2AsO_4 per litre are added, then 30 c.c. of hydrochloric acid. The mixture is left for twenty minutes, after which two drops of methyl-orange or indigo solution are added as indicator, and the mixture titrated with an equivalent solution of potassium bromate. The method is recommended as a general one in analysis, and as a more accurate and cheaper substitute for iodometric methods.

In the presence of a large excess of hydrogen peroxide, chromic acid is at first rapidly reduced, although the reaction is not instantaneous, after which the hydrogen peroxide is catalytically decomposed under the influence of the chromium tri- and sesqui-oxides, but the relative proportion of the two last formed finally does not alter with the concentration or quantity of hydrogen peroxide employed, the reaction being one of chemical equilibrium between the two oxides, a fact which was confirmed by the measurement of the concentration of the hydrogen ions in various mixtures.

* The fresh matter is published also in *Zeitsch. anorg. Chem.*, 1910, 69, 179–222.

Contrary to Riesenfeld's assumption (*loc. cit.*), it is shown that the form of curves obtained for the decomposition of hydrogen peroxide in the presence of dichromate is best explained by the fact that, after the reduction of the dichromate and the establishment of equilibrium between the two oxides, the catalytic decomposition of the hydrogen peroxide proceeds without any further change in the catalyst, or, if any change does occur, it is a reversible one, and only depends on the concentration of the hydrogen peroxide at the given moment. The catalytic properties of chromic acid in no way depend on its previous history, and the effect of the fresh acid is identical with that of the acid after having been used several times; it is evident therefore that no irreversible changes take place. The curves and the general characteristics of the reaction are closely analogous to those of fermenting processes.

Z. K.

Catalysis of Hydrogen Peroxide. EUGEN SPITALSKY (*Ber.*, 1910, 43, 3187—3201).—A reply to the criticisms of Riesenfeld (*Abstr.*, 1908, ii, 951). It is also shown that the usual method of determining the velocity of the catalytic decomposition of hydrogen peroxide by measuring the rate at which oxygen is evolved gives the same results as the direct titration of the hydrogen peroxide with potassium permanganate.

T. S. P.

The Colours of Colloidal Sulphur. RAPHAEL E. LIESEGANG (*Zeisch. Chem. Ind. Kolloide*, 1910, 7, 307—308).—If drops of a 20% citric acid solution are placed on a thin layer of a solidified solution containing gelatin and sodium thiosulphate, the precipitation of sulphur which results from the diffusion of the acid is accompanied by the development of colour effects. In transmitted light the colour is a deep lilac-blue. The colour is not due to interference, but appears to be determined by the size of the colloidal particles. After about twenty-four hours, the colour effects disappear, and this is supposed to be due to the conversion of S_α into S_γ .

H. M. D.

Reduction of Phosphoryl Chloride by Hydrogen under the Influence of the Electrical Discharge. AUGUSTE BESSON and L. FOURNIER (*Compt. rend.*, 1910, 151, 876—878. Compare *Abstr.*, 1910, ii, 121).—When the vapour of phosphoryl chloride mixed with pure dry hydrogen is submitted to the action of the silent electrical discharge, the armatures slowly become coated with a yellow solid. If this is removed by hot water and dried in a vacuum, it is obtained as an easily oxidised, reddish-yellow powder having the composition P_2O . It appears to be identical with the oxide obtained by the action of phosphine on phosphoryl chloride in presence of hydrogen bromide (*Abstr.*, 1898, ii, 216; 1901, ii, 502), the existence of which has been questioned by other investigators. The action is stated to take place in accordance with the equation: $2POCl_3 + 4H_2 = P_2O + 6HCl + H_2O$.

The reaction was carried out in an apparatus of fused silica which is described in detail. The use of glass for the purpose is inadmissible,

W. O. W.

Safety Explosives Employed in Mines. J. TAFFANEL (*Compt. rend.*, 1910, 151, 873—876).—It is shown experimentally that the gases formed by the detonation of safety explosives of the securite type contain a much greater proportion of carbon monoxide when the charge is enveloped in the usual paraffined wrapper than when the explosive is uncovered, or wrapped in ordinary paper or asbestos. The presence of the secondary flame accompanying explosion appears to depend largely on the presence of an oxidisable envelope, or of coal dust. It is not seen when asbestos paper is employed, and the use of the latter, therefore, enables heavier charges to be fired with safety.

W. O. W.

Bromo- and Hydrobromo-derivatives of Silicon. ADOLPHE BESSON and L. FOURNIER (*Compt. rend.*, 1910, 151, 1055—1057).—Four kilograms of the crude product arising from the action of hydrogen bromide on silicon at a red heat were fractionally distilled under diminished pressure. About 90% of the liquid consisted of silicon tetrabromide, the remainder containing tribromosilicomethane with a small quantity of dibromosilicomethane, SiH_2Br_3 , a spontaneously inflammable liquid, b. p. about 75° , and probably bromosilicomethane, SiH_3Br , b. p. 30 — 40° .

The product of the action of the silent electric discharge on tribromosilicomethane yielded on fractionation silicon tetrabromide, hexabromosilicoethane, colourless crystals, m. p. 95° , b. p. 265° , an octabromide, Si_2Br_8 , crystals, m. p. 133° , a decabromide, $\text{Si}_3\text{Br}_{10}$, m. p. 185° (decomp.), together with an uninvestigated yellow residue.

Silicon tetrabromide differs from the tetrachloride in not undergoing reduction when mixed with hydrogen and submitted to the silent electrical discharge.

W. O. W.

The History of "Potash" and of its Name. EDMUND O. VON LIPPMANN (*Chem. Zeil.*, 1910, 34, 1217—1219, 1226—1228, 1235—1237).—Historical.

L. DE K.

The Isomorphism of Potassium and Sodium Compounds. ERNST SOMMERFELDT (*Zeitsch. anorg. Chem.*, 1910, 69, 47—51).—The question of the possible isomorphism of potassium and sodium compounds has been studied in the double sulphates, blödite, $\text{Na}_2\text{Mg}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$, and leonite, $\text{K}_2\text{Mg}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$, the crystals being examined by the ultramicroscope.

Crystals of blödite become turbid if containing more than 0·8% K_2SO_4 , the number of particles increasing with the time, whilst leonite only shows similar particles when as much as 11·6% Na_2SO_4 is present.

According to Ostwald, the crystallisation of a supersaturated solution is only brought about by a foreign salt if the latter is isomorphous with the salt in solution. The crystallisation of a supersaturated solution of potassium sulphate on the addition of a crystal of ammonium sulphate may be explained by the dissolution of the crystal, displacing potassium sulphate. In accordance with this explanation, a readily soluble salt, such as potassium iodide, also

brings about the crystallisation of potassium sulphate. Ostwald's criterion may, therefore, sometimes give misleading results.

C. H. D.

A Characteristic Behaviour of Alkali Phosphate. ERNST SALKOWSKI (*Zeitsch. physiol. Chem.*, 1910, **69**, 475—478).—It was noticed that the addition of sodium hydroxide to an American meat juice caused it to set into a crystalline mass. When exposed to the air, the juice deposits crystals of potassium dihydrogen phosphate, and the addition of sodium hydroxide no longer causes crystallisation to occur in the liquid.

W. D. H.

Some New Compounds of Nitrogen and Hydrogen with Lithium. I. FRANZ W. DAFERT and R. MIKLAUZ (*Monatsh.*, 1910, **31**, 981—996. Compare Abstr., 1909, ii, 882).—Metallic lithium combines with pure, dry nitrogen at the ordinary temperature, amorphous lithium nitride, Li_3N , being formed; the presence of relatively small quantities of oxygen or hydrogen, however, will completely prevent the reaction. Lithium is not attacked by dry air at the room temperature.

Lithium nitride has m. p. 840—845°; the fused substance rapidly attacks iron, nickel, copper, platinum, porcelain, and other silicates. At 870° it will eat through any containing vessel. It penetrates through vessels of magnesia as through a filter.

When heated at 220—250° in a current of hydrogen, a new compound, trolithiumammonium, Li_3NH_4 , is formed from the amorphous nitride. If this compound is heated above 340° in an atmosphere of hydrogen, part of its hydrogen is expelled, to be absorbed again on cooling. If the temperature is raised to 480°, pure trolithiamamide, Li_3NH_2 , is formed. This latter compound is also formed directly by the action of hydrogen on crystallised lithium nitride which has been obtained by heating lithium at 460° in a current of nitrogen; the reaction is so vigorous that the amide is obtained as a fused mass.

Trolithiumammonium is an extremely hygroscopic substance, evolving hydrogen and ammonia under the action of water. Trolithiamide possesses similar properties; it is not sensitive towards light.

T. S. P.

Photo-Halides. II. WILLEM REINDERS (*Chem. Weekblad*, 1910, **7**, 993—1005. Compare Abstr., 1910, ii, 1062).—The author advances arguments in favour of the theory that the photo-halides are absorption compounds of colloidal silver and normal halides. He does not consider that there is any evidence to support the theory that they are sub-halides.

A. J. W.

"Ripening" of Silver Halide Emulsions. RAPHAEL E. LIESEGANG (*Zeitsch. physikal. Chem.*, 1910, **75**, 374—377).—The increase in size of the particles of silver halides, the so-called "ripening" of photographic plates, may be accounted for in two ways: (1) by the association of small particles, a process analogous to the coagulation of colloids, and (2) by the gradual increase in size

of the larger particles at the expense of the smaller, owing to the greater solubility of the latter.

The first process must be associated with a kind of diffusion which could not take place in a solidified gelatin film, and the observation that ripening proceeds rapidly in such a dried film supports the latter view. Further evidence in favour of this explanation is adduced.

G. S.

Calcium Silicates in Cement. L. Sz. SZATHMÁRY (*Zeitsch. Kryst. Min.*, 1910, **48**, 448; from *Vegyészeti Lapok*, 1907, **2**, No. 7, and *Bányászati és Kohászati Lapok*, 1908, **46**, 635—652).—Several calcium silicates have been prepared synthetically, but some of them are probably of the nature of solid solutions. Which of these are present in cements the author leaves undecided. The calcium aluminate, $2\text{CaO}\cdot\text{Al}_2\text{O}_3$, is probably a constituent of cement. Incidentally, the following analysis is given of [impure] wollastonite from Csiklova, Hungary.

SiO_2	CaO	Fe_2O_3	CO_2	H_2O	Total
41.95	49.49	0.58	4.31	0.58	99.91

L. J. S.

The Alloys of Tellurium with Cadmium and Tin. MATSUSKE KOBAYASHI (*Zeitsch. anorg. Chem.*, 1910, **69**, 1—9; *Mem. Coll. Sci. Eng. Kyoto*, 1910, **ii**, 353—363).—Mixtures of cadmium and tellurium, fused in glass or porcelain tubes in an atmosphere of carbon dioxide, have been submitted to thermal analysis. The freezing-point curve has a maximum at about 1041° , corresponding with the compound TeCd , but it is not possible to prepare this compound in a pure condition under ordinary pressure, owing to the volatility of cadmium. The two eutectic points lie so near to the freezing points of cadmium and tellurium respectively as to be indistinguishable from them.

The freezing-point curve of mixtures of tellurium and tin also has a maximum at 780° , corresponding with the formula TeSn . The eutectic point between this compound and tellurium lies at 393° and 86% Te. The compound TeSn has $D_{10} 6.472$, and does not form solid solutions with tin or tellurium (compare Fay, *Abstr.*, 1907, **ii**, 880; Blitz and Mecklenburgh, *Abstr.*, 1909, **ii**, 1022).

The thermal results are confirmed by microscopical examination.

C. H. D.

Falk's White Lead. JULIUS F. SACHER (*Chem. Zeit.*, 1910, **34**, 1261—1263. Compare *Abstr.*, 1910, **ii**, 712, 1067).—When lead carbonate, lead oxide, and lead acetate are kneaded together, the product is not $5\text{PbCO}_3\cdot 2\text{Pb(OH)}_2\cdot \text{PbO}$, but a mixture in varying proportions of normal lead carbonate and white lead. The mixtures only become white when air, containing carbon dioxide, has access, otherwise a yellow or red colour persists. True white lead, examined microscopically, is always amorphous, and pure normal lead carbonate is always crystalline, different preparations differing only in the size of their crystals.

The decomposition of white lead by hydrogen sulphide, observed by Falk, carbon dioxide being liberated, is due to the presence of lead acetate, the acetic acid set free decomposing a further quantity of carbonate.

C. H. D.

Formation of Colloidal Copper. ANDRÉ RASSENFOSSÉ (*Bull. Acad. roy. Belg.*, 1910, 738—741).—Copper sulphate in sulphuric acid is reduced by various organic liquids, forming at first probably violet cuprous sulphate, and finally colloidal copper.

When a few drops of alcohol are placed in a solution of copper sulphate in sulphuric acid, a violet zone which gradually becomes brown is formed between the two liquid layers. On gently warming, it disappears to re-appear on cooling, but at 45° it becomes yellow. The solution is stable, and is not affected by filtration or by treatment in a centrifugal machine, but when submitted to an electric current deposits a deep reddish-brown, granular, pulverulent copper, quite different from the coherent deposit obtained from a solution of copper sulphate in sulphuric acid.

Similar results, with some difference in details, are shown when methyl alcohol, ether, acetone, acetic acid, or chloroform is added to such a solution, and a solution of copper phosphate in phosphoric acid shows similar behaviour.

T. A. H.

Corrosion of Copper and Iron Alloys by Water Containing Salt and Air. Oxidation of Copper at High Temperatures. WILLEM P. JORISSEN (*Zeitsch. angew. Chem.*, 1910, 23, 2305—2306).—A specimen of delta metal from the keel of a ship, which had been attacked by sea-water, was found to contain 41·1% of cuprous oxide, no cupric oxide being present; the zinc had completely disappeared. Cuprous oxide was also formed from copper which had been kept for two years either in sea-water or in a solution of sodium chloride of the same chlorine content. When copper is partly immersed in distilled water, cuprous oxide is formed on the submerged part, whereas cupric oxide is formed on the other part.

Cuprous oxide is formed when air is continually circulated over copper heated to a temperature above that at which dissociation of cupric oxide takes place.

Analyses are given of (a) a piece of iron which had been in the ground for years, (b) iron used to protect a copper alloy in a pump from corrosion, (c) iron used for the same purpose in a ship's condenser, (d) some Dutch bronze cannons fished up from the Straits of Messina.

T. S. P.

Occluded Gas in Alloys of Copper. G. GUILLEMIN and B. DELACHANAL (*Compt. rend.*, 1910, 151, 881—883. Compare Abstr., 1909, ii, 144).—Results of analyses are given showing the total volume of occluded gas and the percentage of carbon dioxide, carbon monoxide, methane, hydrogen, and nitrogen in different specimens of brass, bronze, aluminium bronze, phosphor-bronze, and tin.

Forgeable brass contains hydrogen, carbon dioxide, and carbon monoxide; the latter predominates in unsound ingots containing

blow-holes. The presence of hydrogen does not impair the mechanical properties of brass. The small amount of gas in phosphor-bronze consists chiefly of carbon dioxide and hydrogen. Commercial tin contains hydrogen, carbon dioxide, and carbon monoxide.

W. O. W.

The Tempering of Bronzes. L. GRENET (*Compt. rend.*, 1910, 151, 870—871).—The connexion between the temperature at which bronze is annealed after tempering and the hardness of the product appears to be the same as in the case of steel. W. O. W.

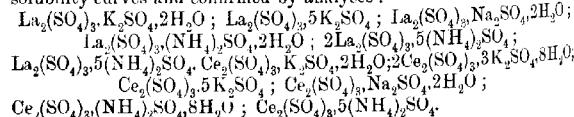
The Formation of Cuprous Iodide from the Physico-chemical Standpoint. P. P. FEDOTÉEFF (*Zeitsch. anorg. Chem.*, 1910, 69, 22—37).—The reaction occurring between copper and iodine in presence of water has been studied: $\text{Cu} + \text{I}_2 \rightarrow \text{CuI}_2 \rightleftharpoons \text{CuI} + \text{I}$. Equilibrium at 20° is only reached after fifteen to thirty hours' shaking. The quantity of iodide dissolved increases with the proportion of iodine. In solutions in equilibrium with solid iodine, the concentration of the dissolved iodine increases with that of the copper. Isotherms for the two systems (cuprous iodide and iodine respectively as solid phase) are drawn, and it is shown that in all the saturated solutions the ratio Cu : 4I is maintained. The range of composition within which cupric iodide is stable is increased by raising the temperature.

Assuming that the complex ion present is I_3^- , the ratio $\text{I}_3^-\text{I}^{\prime -}$ at 20° = 0.964. As the cation does not enter into the equilibrium, the general conclusion is drawn, that in aqueous solution of iodine in iodides the iodine is equally divided between the simple and the complex ions. The formula of cupric iodide in a solution saturated with iodine is CuI_3^{1-} . The number of complex ions increases with rising temperature.

The solubility-product $\text{Cu}^{\prime +} \times \text{I}' = L = 5.06 \times 10^{-12}$ (Bodländer and Storbeck, *Abstr.*, 1902, ii, 607), so that $K = (\text{Cu}^{\prime\prime})^2(\text{I}')^4/L^2(\text{I}_2) = 4.18 \times 10^{-14}$.

The potential of the iodine electrode at 20° is $e_0 = 0.900 + 0.029\log(\text{I}_2)/(\text{I}')^2$; and of the $\text{Cu}^{\prime\prime}/\text{Cu}^{\prime +}$ electrode at 20°, $e_0 = 0.476 + 0.058\log(\text{Cu}^{\prime\prime})/(\text{Cu}^{\prime +})$. C. H. D.

Double Sulphates formed by Lanthanum and Cerium Sulphates with the Alkali Sulphates. BARRE (*Compt. rend.*, 1910, 151, 871—873).—The solubility of lanthanum and cerium sulphates in aqueous solutions of potassium, sodium, and ammonium sulphates at different concentrations has been determined. The existence of the following double salts has been revealed by the solubility curves and confirmed by analyses:



Lanthanum and cerium sulphates are more soluble in a solution of ammonium sulphate than in one of sodium or potassium sulphate.

W. O. W.

Nature of the Oxides Causing the Colour of Oriental Sapphires. AUGUSTE VERNEUIL (*Compt. rend.*, 1910, 151, 1063—1066).—The opinion that the colour of oriental sapphires is due to ferric oxide is based on analyses by Vauquelin, Forchhammer, and others. The author having previously described the preparation of artificial sapphires from fused alumina coloured by ferric and titanic oxides (*Abstr.*, 1910, ii, 212), now shows that the latter is present in the natural stones; three sapphires of different origin being found to contain 0·03—0·058% of titanic acid. The conclusion is drawn that the colour of sapphires is due to titanium, present as an oxide or as a titanate of iron.

W. O. W.

Catalytic Properties of Asbestos. P. A. TSCHIEISHWILI (*J. Russ. Phys. Chem. Soc.*, 1910, 42, 856—862).—An acid solution of N/20-potassium permanganate filtered through asbestos is reduced in each of the first eight filtrations, after which it is no longer reduced on filtration. Ten c.c. loses in this way 0·025 c.c. for each filtration, and the results obtained are exactly the same for asbestos from various sources, and whether it has only been treated with acids and water or whether it has been ignited before such treatment. The precipitate formed on the asbestos has no catalytic influence on the reduction of the permanganate, and it does not consist of manganese peroxide.

It is much more convenient to use asbestos in the filtration of permanganate solutions, and allow 0·025 c.c. as correction, than to use glass wool, through which a clear filtrate, cannot be obtained.

Z. K.

The Rusting of Iron. V. ANDSTRÖM (*Zeitsch. anorg. Chem.*, 1910, 69, 10—21. Compare Moody, *Trans.*, 1906, 89, 720; Friend, *Proc.*, 1910, 26, 179; Lambert and Thomson, *Trans.*, 1910, 97, 2426).—Thin strips of soft iron are enclosed with water (the oxygen and carbon dioxide in which have been estimated) in flasks, closed by ground stoppers sealed by mercury. After shaking for a definite time, the rust formed is collected on a filter, that present as an incrustation on the strips being added, and the iron in the filtrate is also estimated.

The quantity of iron removed by corrosion is independent of the proportion of carbon dioxide in the water, and is proportional to the amount of dissolved oxygen, the ratio of iron to oxygen corresponding with Fe_2O_3 . The dissolved portion of the iron corresponds with $\text{Fe}(\text{HCO}_3)_2$. These results are shown in the form of curves. When very little oxygen is present, but the solution contains large quantities of carbon dioxide, corrosion only proceeds very slowly.

The results are interpreted as indicating that rusting is principally due to the action of oxygen, probably with intermediate formation of hydrogen peroxide.

C. H. D.

Dissociation of Ammoniacal Ferrous Chlorides and the Formation of Ferrous Nitride. FERNAND GIRARDET (*Bull. Soc. chim.*, 1910, [iv], 7, 1028—1034. Compare Lang and Rigaut, *Trans.*, 1899, 75, 883; Jackson and Derby, *Abstr.*, 1900, ii, 596).—The

interaction of ammonia with ferrous chloride is reversible between -18° and 350° , and a study of the tensions of dissociation of the products indicates that two compounds of this type exists, represented by the formulae $\text{FeCl}_2 \cdot 6\text{NH}_3$ and $\text{FeCl}_2 \cdot 2\text{NH}_3$. The former is stable only at low temperatures. Above 350° , the chloride is decomposed and ferrous nitride is formed, the optimum temperature for this reaction being 480° . In preparing ferrous nitride, it is best to heat the chloride to 480° , and then introduce ammonia gas. Full experimental details and tables of dissociation tensions are given in the original.

T. A. II

Chemical Constitution of Iron-pyrites and Pyrolusites.
L. BENEDEK (*Zeitsch. Kryst. Min.*, 1910, 48, 447-448; from *Magyar. Chem. Folyóirat*, 1908, 14, 85-81).—Iron-pyrites when heated to a red-heat in an atmosphere of carbon dioxide loses half of its sulphur, and ferrous sulphide (FeS) remains. At $300-400^\circ$ in water vapour half the sulphur is also lost, after which the ferrous sulphide is decomposed with the production of ferrous oxide and hydrogen sulphide. These reactions indicate, in the author's opinion, that the iron in iron-pyrites is ferrous.

Pyrolusite (MnO_2) when heated in an atmosphere of hydrogen passes first into Mn_2O_3 , at 280° into Mn_3O_4 , and finally into MnO . L. J. S.

Preparation of Tantalic Acid from West Australian Fergusonite. Sodium Tantalate. EDGAR WEDEKIND and W. MAASS (*Zeitsch. angew. Chem.*, 1910, 23, 2314—2316).—A specimen of fergusonite from West Australia contained 54·22% Ta_2O_5 , 1·80% C_6O_6 , 27·73% Y_2O_3 , 3·20% Ce_2O_3 , and 0·36% ThO_2 , and owing to the high tantalum content the authors have used it to prepare tantalum pentoxide and derivatives. The acid and basic constituents were separated essentially according to the method of Kriss and Nilson (Abstr., 1887, 706), the residue then consisting essentially of tantalic, columbic, and titanic acids; 7·5 grams of the residue were then carefully added to 15 grams of sodium carbonate fused in a platinum crucible, after which a further 4 grams of sodium carbonate and 1·6 grams of sodium nitrate were added. The cold fusion was extracted with 750 c.c. of water, filtered, and left overnight; 6·4 grams of sodium tantalate crystallised out. The finest crystals were picked out, the remainder dissolved in much hot water, and after cooling, the tantalum precipitated as tantalic acid by means of carbon dioxide (compare Weiss and Lundecker, Abstr., 1901, ii, 942). The tantalic acid was dried at 100°, mixed with a little fuming nitric acid, evaporated to dryness, and then converted into pentoxide by ignition.

Sodium tantalate forms colourless, hexagonal crystals, which give an alkaline solution. Analysis gives $\text{Na}_3\text{Ta}_5\text{O}_{10}\text{H}_{12} \cdot 32\text{H}_2\text{O}$, agreeing with Rose's empirical formula $\text{Na}_3\text{Ta}_5\text{O}_{10} \cdot 25\text{H}_2\text{O}$; $5\text{H}_2\text{O}$ are lost at $105-110^\circ$, a further molecule at 190° , and the last molecule in the blow pipe. It is probably an acid sodium salt of a tritantalic acid of

the formula $\frac{(\text{HO})_2}{(\text{NaO})_2} \text{Ta} \cdot \text{O} \cdot \text{Ta} \cdot \text{O} \cdot \text{Ta} \cdot \frac{(\text{OH})_2}{\text{O}} \cdot \frac{(\text{ONa})_2}{\text{O}}, 10\text{H}_2\text{O}$, the anhydrous tantalate obtained on heating being a hexatantalate. T. S. P.

Gold Tellurides. GIOVANNI PELLINI and E. QUERCIGH (*Atti R. Accad. Lincei*, 1910, [v], 19, ii, 445—449).—The freezing-point curve of the system gold-tellurium has been determined, the alloys being fused in an atmosphere of carbon dioxide. The curve has a single maximum, corresponding with the compound AuTe_2 , melting at 464° . There are two eutectic points, at 12 and 47 atomic % Au and at 416° and 447° respectively. There is no indication of the formation of solid solutions. The compound AuTe_2 occurs in nature as calaverite. As such a compound is not obtained by the action of tellurium on solutions of gold salts, it is probable that the mineral has been formed by a process of fusion.

C. H. D.

Halogen Compounds of Rhodium. MILE. G. GOLOUBKINE (*Bull. Soc. chim. Belg.*, 1910, 24, 388—396).—Spongy rhodium readily dissolves in a solution of hydrochloric acid saturated with chlorine, or in a solution of hydrobromic acid saturated with bromine, giving the corresponding halogen compounds. The preparation of the bromine compounds is described.

One gram of spongy rhodium is heated with 24 grams of 40% hydrobromic acid containing 7 grams of bromine in a sealed tube at $80\text{--}100^\circ$ for forty-eight hours. The contents of the tube are distilled under diminished pressure, the residue treated with a little water, and again distilled to remove all hydrobromic acid. The bromide remaining is dissolved in water, and the solution evaporated in a vacuum over sulphuric acid, the final drying of the product being carried out in a vacuum over fused potassium hydroxide. If the spongy rhodium used contains zinc or bismuth, the resulting impure bromide is reduced in a current of hydrogen; the zinc or bismuth bromide sublimes, leaving pure rhodium, from which the pure bromide is obtained by the treatment already detailed.

Rhodium tribromide, $\text{RhBr}_3 \cdot 2\text{H}_2\text{O}$, is a blackish-red substance, which is very soluble in water. When heated at $100\text{--}140^\circ$ it loses, not only water, but also hydrogen bromide. With potassium hydroxide the solution gives a precipitate of the *hydrocybromide*, $\text{Rh(OH)}_2\text{Br} \cdot 2\text{H}_2\text{O}$, and from the filtrate, dark red crystals of *potassium rhodobromide*, K_2RhBr_3 , are obtained.

Potassium, sodium, rubidium, ammonium, and berrium rhodobromides are prepared by adding a slight excess of rhodium bromide to the solutions of the bromides of the metals mentioned. The solution is evaporated to dryness, and the excess of rhodium bromide extracted with alcohol, leaving the rhodobromide undissolved. They possess the general formula $\text{M}'_2\text{RhBr}_3$, and are readily soluble in water; most of them are dark red in colour, the sodium salt being brick-red.

A warm concentrated solution of potassium iodide produces a black precipitate of *rhodium iodide*, RhI_3 , from a solution of rhodium bromide. Dilute solutions give no precipitate in the cold.

T. S. P.

Mineralogical Chemistry.

Iron-pyrites from Hungary. A. LIFFA (*Zeitsch. Kryst. Min.*, 1910, **48**, 441—442; from *Földtani Közlöny*, 1908, **38**, 276—294, 405—423).—Crystallographic descriptions are given of iron-pyrites from various Hungarian localities. Crystals (penetrated by quartz) from Csungany gave on analysis by K. Emszt:

Fe.	As.	Ni.	S.	SiO ₂ .	Total.
45·36	trace	0·05	51·61	2·84	99·96

L. J. S.

Bломstrandine from the Urals. Otto HAUSER and H. HERZFELD (*Centr. Min.*, 1910, 756—764).—Some black crystals, supposed to be aschynite, embedded in pegmatite from Miask, proved on analysis to be the bloomstrandine of Brügger (*Abstr.*, 1907, ii, 885). Approximate goniometric measurements are given; D 5·00:

Ta ₂ O ₅ .	Ch ₂ O ₅ .	TiO ₂ .	SnO ₂ .	WO ₃ .	ZrO ₂ .	UO ₂ .	ThO ₂ .	Loss on ignition.	Total.
1·30	15·08	34·07	0·20	trace	0·50	3·24	7·93		
26·66	4·69	1·36	1·73	0·16	1·04	0·23	0·35	0·96	99·95

The ratio of meta-columbates to meta-titanates is here 1 : 1, whilst in the Norwegian mineral this is 1 : 2 and 1 : 4. L. J. S.

Nephrite from the Harz. J. UHLIG (*Jahrb. Min.*, 1910, ii, 80—103).—Small veins, the largest of them 20 cm. in thickness, of nephrite occur in the gabbro-serpentine rocks of the Radauthal, near Harzburg. The material is pale green, greyish-green, or light grey, but of a darker green colour (due to enclosed chlorite) in a few strings. Under the microscope it is seen to consist of a felted mass of actinolite needles with occasional chlorite. At times, however, the actinolite fibres have a parallel arrangement, giving rise to a finely fibrous texture; this (“Fasernephrit”) is the material recently described from the same locality under the name nephritoid (J. Fromme, *Abstr.*, 1910, ii, 314). Analysis I, of light grey material, corresponds approximately with the actinolite formula Mg₃Ca(SiO₃)₄:

	H ₂ O	H ₂ O
I. SiO ₂ , TiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , Cr ₂ O ₃ , FeO, NiO, MnO, CaO, MgO, K ₂ O, Na ₂ O, (Ca ₂ Si ₂ O ₅) ₂	trace	4·38 0·31 0·06 12·72 21·42 2·28 0·28 3·75 98·98 2·25
II. 49·47 0·11 0·52 0·50 — 7·67 0·07 0·80 22·91 10·44 0·08 0·30 0·43 2·10 100·29 1·50		

Another small vein of much the same appearance consists of a compact felted mass of pyroxene needles and scales, together with some prehnite and garnet. This pyroxene gave analysis II, agreeing approximately with the diopside formula Ca(Mg,Fe)(SiO₃)₂. L. J. S.

Zeolites from Nadap, Hungary. BÉLA MAURITZ (*Zeitsch. Kryst. Min.*, 1910, **48**, 439—441; from *Földtani Közlöny*, 1908, **38**, 190, 231, and *Ann. hist.-natur. Musei Nation. Hungarici*, 1908, 6, 537—545, 546—554).—Cavities and crevices in weathered andesite

in the neighbourhood of Nadap, comitat Fejér, contain the crystallised zeolites, epistilbite (not before recorded from Hungary), heulandite, chabazite, and stilbite, together with calcite, amethyst, iron-pyrites, and fluor-spar. Crystallographic descriptions are given of each of these zeolites, and analyses of the heulandite (I and II) and stilbite (III and IV) :

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	SrO	Na ₂ O	K ₂ O	Li ₂ O	H ₂ O	Total
I.	50.57	16.93	—	6.91	0.93	1.63	1.25	trace	16.15	100.42
II.	50.71	17.30	—	7.05	0.88	1.80	1.37	trace	15.87	100.98
III.	55.79	17.05	trace	7.82	—	1.46	0.20	—	18.65	100.97
IV.	55.78	16.70	trace	7.86	—	1.56	0.26	—	18.79	100.95

L. J. S.

Analyses of Hungarian Minerals. ALEXANDER VON KALECSINSKY (*Zeitsch. Kryst. Min.*, 1910, 48, 446—447; from *Jahresber. k. ungarisch. geol. Anstalt*, for 1907, 1909, 294—314).—A report on the work of the chemical laboratory of the Hungarian Geological Survey includes many analyses of limestones, coals, and clays, and the following analyses (I) of kaolinite from Kovászna, and (II) of magnesite from Jolsva :

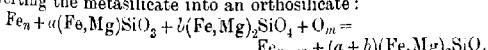
	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	CaO	Moisture	Loss on ignition	Total
I.	48.71	35.16	1.10	0.34	1.26	3.15	10.37	100.09
II.	72.26	25.43	2.01	0.34	0.28	—	100.29	

L. J. S.

Behaviour of Gabbro Magma in Fusions. HANS ANDESSNER (*Jahrb. Min.*, 1910, *Beil.-Bd.*, 30, 467—494).—Hornblendite from Kals, Tyrol, was used in the experiments; this is a schistose rock composed largely of hornblende, together with some zoisite, quartz, rutile, and apatite, and having practically the same bulk composition as a gabbro. When fused alone the glassy product has much the characters of a basalt, and under the microscope shows crystals of magnetite, plagioclase, and augite. In other experiments, the amphibolite was fused with various proportions of olivine, quartz, tungstic acid, nephelite, alumina, or anorthite. The microscopical structure of the products are described in detail. The minerals formed include magnetite, plagioclase, olivine, augite, nephelite, spinel (picotite), and corundum; the last two of these being produced when an excess of alumina is present.

L. J. S.

Meteorites. WALTER ANDRE WAHL (*Zeitsch. anorg. Chem.*, 1910, 69, 52—96).—An analytical comparison of meteoric stones and minerals with terrestrial rocks and minerals shows that the former are distinguished by containing relatively larger proportion of oxygen. The different classes of siderolites differ principally in their state of oxidation; thus, those containing only metallic iron and olivine may be derived from those containing iron, pyroxene, and olivine by oxidation, a part of the iron being oxidised to ferrous oxide and then converting the metasilicate into an orthosilicate :



When still less oxygen is present, silica is found in the form of tridymite. The difference between enstatite-chondrites and ordinary chondrites is also shown to be one of the degree of oxidation. The presence of calcium sulphide in certain meteorites is explained in the same way.

Chondrites of loose structure are to be regarded as fragmentary, of the nature of tuffs. The various forms of chondrulitic structure may be explained by the breaking up of a silicate magma into spray in a hot atmosphere and the crystallisation of the drops from outside inwards. The consolidation of the tuffs is brought about by heat, and may be imitated artificially. The structure of the original mass is represented by eucrite. Explanations are given of the other derived structures, including veins and breccias.

C. II. D.

Meteoric Stone of Mern, Seeland. ARISTIDES BREZINA (*Jahrs. Min.*, 1910, ii, Ref. 207—208; from *Danske Vidensk. Selsk. Skrifter*, 1909, [vii], 6, (3), 113—125).—This stone fell on August 22nd, 1878, at Mern, near Praesto, in Seeland. Its original weight was $7\frac{1}{2}$ pounds. It is described as the representative of a new type, "veined crystalline enstatite-spheroidal-chondrite." The constituents are olivine, rhombic pyroxene, clinoenstatite, nickel-iron, troilite, and chromite. The chemical composition is:—

SiO_2	Al_2O_3	FeO_3	MgO	K_2O	Na_2O	H_2O	CO_2	S	Fe
39·81	2·70	12·23	15·46	0·46	1·35	0·66	2·47	2·47	13·50

The iron is in part present as sulphide, and of the sulphur, 23% is liberated as hydrogen sulphide when the material is treated with hydrochloric acid. 45·20% is insoluble in hydrochloric acid. Traces of phosphoric acid and manganese are present.

I. J. S.

Physiological Chemistry.

Putting into Action of the Human Machine. JULES AMAR (*Compt. rend.*, 1910, 151, 892—894).—A subject set to do muscular work immediately on rising from sleep showed a sudden temporary diminution in his respiratory quotient. This reached a minimum at 0·82 after four minutes from the commencement of the experiment; after four minutes' rest it had risen to 0·99, but at the end of four minutes' further exertion it fell to 0·86.

W. O. W.

The Question of the Oxidation of the Products of Zymic Fermentation during Respiration. LEONID IWANOFF (*Biochem. Zeitsch.*, 1910, 29, 347—349).—Polemical in reply to Kostytschew (Abstr., 1910, ii, 148).

W. J. Y.

The Isoelectric Constants of the Constituents of Blood corpuscles, and their Relationship to Haemolysis by Acids. LEONOR MICHAELIS and DENGU TAKAHASTU (*Biochem. Zeitsch.*, 1910, 29, 439—452).—The methods employed were those repeatedly used by

Michaelis and his collaborators in the previous investigations on proteins, namely, the determinations of the hydrogen ion concentration in which coagulation most readily takes place, and the method of electrical cataphoresis. They also determined the hydrogen ion concentration in which haemolysis takes place. The coagulation optimum for the stroma substance of all the species of blood investigated was $[H^+] = 1 \cdot 10^{-5}$. The isoelectric constant of oxyhaemoglobin is $[H^+] = 1 \cdot 8 \times 10^{-7}$. Red blood-corpuscles in isotonic solution remain intact, when $[H^+] = 1 \cdot 10^{-5}$. On further addition of acids, haemolysis takes place. On the assumption that the coagulation optimum concentration of hydrogen ions represents the isoelectric point, the conclusion is drawn that the haemoglobin is only held intact in the corpuscles when they are negatively charged.

S. B. S.

Influence of Electrolytes and Non-electrolytes on the Permeability of Red-Blood Corpuscles. MIKOSLAV MICULICICH (*Zentbl. Physiol.*, 1910, 24, 523—527).—The effect was ascertained of the separate addition of a number of salts and non-electrolytes on the time of complete haemolysis of defibrinated ox-blood by urethane, alcohol, and saponin. The substances were added in such a concentration that the resulting mixtures were isotonic with 0·97% sodium chloride. By employing different salts of the same base, the anions were arranged into a comparative group for each haemolysin, in order of the length of time required for haemolysis. In a similar manner by using different salts of the same acid, the cations were arranged into similar group. It was found that with very few exceptions the order of grouping of both anions and cations was the same for urethane and alcohol, but differed markedly in the case of saponin. This is explained by the fact that saponin brings about haemolysis in different manner from the other two. The differences in the times of haemolysis observed with the various salts is attributed to the different influence of the electrolytes on the permeability of the blood-cells to the haemolysin. Differences were also obtained in the cases of non-electrolytes.

W. J. Y.

Permeability of Red Corpuscles in Physiological Conditions, especially to Alkali and Alkali-earths. G. GRYNS (*Proc. K. Akad. Wetensch. Amsterdam*, 1910, 489—491).—Hamburger's data and conclusions (Abstr., 1910, ii, 1080) on this subject are questioned.

W. D. H.

The Influence of Oxidation in Living Cells according to Researches on the Red Corpuscles. OTTO WARBURG (*Zeitsch. Physiol. Chem.*, 1910, 69, 452—462).—Experiments on the red corpuscles of the goose suspended in Locke's solution confirm the views of Overton and H. Meyer on the importance of the lipoid membrane in oxidation and narcosis. The general result of the action of various reagents, the solubilities of which in water and oil are given, is that the occurrence of a lipoid phase influences chemical changes which diminish oxidation more than the occurrence of a watery phase.

W. D. H.

Hæmolysis by Ammonia, Sodium Hydroxide, and Sodium Carbonate. OSCAR GROS (*Biochem. Zeitsch.*, 1910, 29, 350—366).—The relationship between the concentration of the ammonia and carbonate, and the time necessary for complete hydrolysis can be represented by the equation $c^m \cdot t = k$ (where c = concentration, t = time, k = constant), in which the exponent m varies between 0·65 and 0·71. The ammonia or carbonate appears to be adsorbed by the corpuscle, and the amount adsorbed regulates the rate of hydrolysis. This relationship only holds so long as the amount of ammonia present is large compared with that used in hæmolysis or by-reactions. When small quantities of ammonia are employed, so that the time necessary for complete hæmolysis is large, nearly all the ammonia is adsorbed, and the rate of hæmolysis is proportional to the amount of ammonia, and inversely proportional to the concentration of blood-corpuscles. In the case of sodium hydroxide, the reaction equation is $C^{0.7} \cdot t = k$. It was only possible to investigate this reaction in low concentrations.

S. B. S.

A Proof of the Presence of Toxic Substances in the Blood of Animals after Thyroidectomy. PAUL TRENDLEBENBURG (*Biochem. Zeitsch.*, 1910, 29, 396—407).—It has been shown by Reid Hunt (Abstr., 1905, ii, 847) that mice which have been fed on thyroid gland or on blood from cases of Basedow's disease (exophthalmic goitre) are able to withstand injections of acetonitrile many times as large as the amount required to kill normal mice.

A similar resistance is now obtained by feeding mice on the blood of cats from which the thyroid gland has been removed. The conclusion is drawn that this is due to the presence of toxic substances in the blood of the cats, and thus adds support to the hypothesis that the thyroid gland functions as a remover of these poisons. W. J. Y.

The Behaviour of Chlorine in Serum. PETER RONA (*Biochem. Zeitsch.*, 1910, 29, 501—508).—The author has employed the method originally used by him for investigating the state of sugar in the blood. He placed serum in dialysing membranes and surrounded them with salt solutions of varying concentrations, and thereby found a concentration which does not alter on dialysis. This concentration corresponds with the amount of free sodium chloride in the serum. From the results the conclusion is drawn that the whole of the chloride in serum is free, and not united to the protein. Nevertheless, the chlorine in the serum directly determined was less than that found by the dialysis method. The difference, although small, was appreciable, and the author ascribes it to the fact that the real concentration of chloride in the serum is greater than the apparent, owing to the fact that the proteins occupy a definite volume in the serum. S. B. S.

The Origin of the Hydrochloric Acid in the Gastric Tabules. MARIE P. FITZGERALD (*Proc. Roy. Soc.*, 1910, B, 83, 56—93).—An historical account is given of the various micro-chemical tests which have been employed by many workers in order to locate the seat of formation of the hydrochloric acid of the gastric juice.

Although evidence connects this origin with the parietal cells of the gastric tubules, hitherto no certainty of this has been attained, neither has it been proved that hydrochloric acid exists in a demonstrable form in the secretion of the glands before this reaches the free surface of the mucosa.

Solutions containing potassium ferrocyanide 1·5% and ammonium ferric citrate 2·25% were injected into rabbits and guinea-pigs, and the animals killed from three to thirty hours after the first injection. This mixture readily formed Prussian blue with hydrochloric acid of a much less concentration than that contained in the gastric juice, but gave no reaction with sodium phosphate or carbon dioxide. Microscopic sections from the stomach showed the presence of Prussian blue in the lumina of the gland tubules, and in the canaliculi in the parietal cells. Hydrochloric acid was thus shown to be already in the free state in the secretion, as it appears in the canaliculi. No definite evidence was obtained of the occurrence of free hydrochloric acid in the cytoplasm of the parietal cells, although a faint blue coloration occasionally observed in them seemed to indicate its presence. The source of the hydrochloric acid in the parietal cells is attributed to the chlorides, which were shown to be present in greater abundance than in the chief cells or the adjacent tissue elements.

W. J. Y.

Oxalic Acid Metabolism. JULIUS POHL (*Zeitsch. exp. Path.*, 1910, 8, 308—311).—The contention of Tomaszewski (Abstr., 1910, ii, 425) that oxalic acid is oxidised by the animal organism is denied. Oxalic acid which was injected into dogs was recovered unchanged from the urine, whilst oxalic acid was not destroyed by incubation with a paste made by grinding the liver of a rabbit.

Parabanic acid was injected into a dog, and was subsequently found in the urine partly unchanged and partly changed into oxalic acid. The two acids were estimated as follows: a portion of the urine was boiled with ammonia to convert the parabanic acid into oxalic acid, and the total amount of the latter determined as calcium salt. Another portion was precipitated with normal lead acetate to remove the oxalic acid, and the parabanic acid in the filtrate converted into oxalic acid with ammonia and determined as such.

It is suggested that parabanic acid is possibly a source of the oxalic acid normally found in the animal organism, and that at an intermediate stage oxaluric acid is formed.

W. J. Y.

Protein Metabolism of the Dog, and the Effect of Feeding with Protein and Protein Cleavage Products on the Secretion of Bile, with Special Reference to Time Relationships. ADAM OEB (*Zeitsch. Biol.*, 1910, 55, 167—235).—The quantity of bile depends on the quantity and kind of protein administered; casein and gliadin are less effective than flesh. It therefore appears that it is not formation of urea, but its work in dealing with the nitrogenous residue, that causes in the liver the increase of bile formation. Uptake increases bile formation. The excretion of sulphur in the bile is in the first four hours after a meal about twice as great as in the next four hours. The excretion of ammonia in the urine falls

after a meal, and is at the maximum in the night. This depends on changes in the alkalinity of the body which accompany the secretion of digestive juices. In the period of digestion, also, relatively more acid equivalents in the form of sulphates and phosphates are excreted than in the period of rest. The fixed alkali behaves in the same way. The flow of bile somewhat elevates excretion of ammonia; in abundant protein feeding, ammonia is excreted in absolutely higher, but relatively lower, amount. After feeding there is a decrease in the excretion of phosphates. On a protein-rich diet, a greater amount of the nitrogen is excreted in the first third of the day than on a protein poor diet; the same is true for protein cleavage products. In a dog with a biliary fistula, nitrogenous equilibrium and even retention can be maintained on abiuetic protein products, provided the nitrogen given is above the protein minimum. The excretion of "neutral sulphur" in such a dog is higher during the digestive period than during rest, but the relationship of this to the sulphur in the food was not determined. The output of sulphates on a protein-rich diet is most marked during the digestive period, and this increase appears more rapidly than that of nitrogen excretion.

W. D. H.

Digestion and Absorption of Nucleic Acid in the Alimentary Canal. E. S. LONDON and ALFRED SCHITTENHELM (*Zeits. physiol. Chem.*, 1910, 70, 10—18).—Previous work on this question has mainly consisted of investigations *in vitro*. The present experiments were carried out *in vivo* in dogs with fistulae. Nucleic acid is neither altered nor absorbed in the stomach, but chemical changes occur in the intestine; a small amount of purine bases is liberated, but the greater part of the nucleic acid is split into dialysable compounds, which contain organically-united purine substances. Following Levene's work these are nucleosides or nucleotides, but they were not identified more closely. The absorption of such compounds occurs in the lower jejunum and ileum. The digestive juices contain no purine bases on a purine-free diet.

W. D. H.

The Inhibition by Cholesterol of the Irritating Action of Oleic Acid. F. W. LAMB (*J. Path. Bact.*, 1910, 15, 129).—In a study of the absorption of triolein and oleic acid in the frog's intestine, the investigation was complicated by the irritating effect of these substances; this may be obviated by mixing oleic acid with an equimolecular amount of cholesterol. Powell White obtained similar results on subcutaneous injection of the same substances.

W. D. H.

The Action of Drugs on the Cerebral Vessels. WALTER E. DIXON and WILLIAM D. HALLIBURTON (*Quart. J. exp. Physiol.*, 1910, 3, 315—318).—The experiments were performed on the carefully isolated brains of dogs; these were perfused with Ringer's solution at constant pressure, and the rate of outflow noted by a drop record. The cerebral blood vessels respond towards drugs in the manner similar to the pulmonary and coronary vessels. Adrenaline,

pilocarpine, and muscarine, drugs well recognised as acting on nerve-endings, cause some dilatation, although they always produce marked constriction of systemic vessels. It is probable that the dilator action is confined to the larger blood vessels, and it is suggested that the action is due to an effect on vaso-dilator nerves. Barium, lead, veratrine, and pituitary extract cause some constriction, the inference being that these drugs here, as elsewhere, act directly on muscle. The constriction with pituitary extract is slight and transient, and is followed by dilatation.

W. D. H.

The Synthetic Formation of Amino-acids in the Liver.
GUSTAV EBBEN and ERNST SCHMITZ (*Biochem. Zeitsch.*, 1910, 29, 423—428).—On perfusion of a glycogen-poor liver with *p*-hydroxy-phenylpyruvic acid, tyrosine could be isolated in the form of the dinaphthalenesulphonyl derivative, and, after perfusion of *p*-phenylpyruvic acid, phenylalanine could be isolated in the form of a carbamic acid. Leucic acid on perfusion gave rise apparently to leucine-carbamic acid. Furthermore, by simple perfusion of a glycogen-rich liver, part of the glycogen appears to give rise to alanine; lactic acid and pyruvic acid being apparently formed as intermediate products.

S. B. S.

A Synthesis with Acetic Acid in the Artificially Perfused Liver. OTTO NEUBAUER and OTTO WARBURG (*Zeitsch. physiol. Chem.*, 1910, 70, 1—9).—In the artificially perfused dog's liver, if the liquid contains *d*-aminophenylacetic acid, there is formed *d*-acetylaminophenylacetic acid in addition to phenylglyoxylic and *l*-mandelic acids.

W. D. H.

Probable Function of Cholesterol in the Production of Uric Acid in the Animal Organism. F. TRAETTA-MOSCA and F. APOLLONI (*Gazzetta*, 1910, 40, ii, 368—377. Compare following abstract).—When a mixture of calf's liver and cholesterol or phytosterol to which a little ammonia has been added is incubated in presence of toluene for two days, uric acid is formed. Neither the liver alone, nor cholesterol, nor putrefying liver yields any uric acid in these circumstances. When the liver has been boiled, no production of uric acid from the mixture can be observed. The authors suppose that by oxidation of the cholesterol, α -hydroxyisobutyric acid is formed, and that this combines with 2 molecules of urea to produce uric acid. The reaction is effected by ferment contained in the liver.

R. V. S.

Importance of α -Hydroxyisobutyric Acid in the Formation of Uric Acid from Cholesterol by means of Calf's Liver. F. TRAETTA-MOSCA and GOLDA MIZZENMACHER (*Gazzetta*, 1910, 40, ii, 378—388. Compare preceding abstract).—In confirmation of the hypothesis that α -hydroxyisobutyric acid is formed as an intermediate product when uric acid is produced from cholesterol and calf's liver in presence of ammonia, the authors find that when α -hydroxyisobutyric acid is mixed with calf's liver, physiological saline

solution, and ammonia, and the mixture incubated for two days in presence of toluene and chloroform, uric acid is produced. The reaction proceeds better in an atmosphere of carbon dioxide than in air. When no hydroxyisobutyric acid is added, smaller quantities of uric acid are formed. Urea added to the mixture does not increase the amount of uric acid produced. The ammonia seems to play a leading part in the reaction. When the liver has been previously boiled, no uric acid is formed. The addition of glycerol, sodium butyrate, or fermentation lactic acid instead of hydroxyisobutyric acid does not lead to an increased formation of uric acid. The estimations of uric acid were effected by the Ludwig-Salkowski method.

R. V. S.

Differentiation of the Tryptic and Proteolytic (Autolytic) Actions of the Liver. FRIEDRICH SIMON (*Zeitsch. physiol. Chem.*, 1910, 70, 65—84).—The course of digestion of various proteins under the influence of trypsin and the autolytic enzyme of the liver are compared; the points to which special attention is paid are the amounts of coagulable nitrogen, uncoagulable nitrogen, and ammonia at various stages. The two enzymes manifest differences, the principal one being that the digestion of the insoluble protein goes on longer in autolytic than in pancreatic digestion, and there is also, perhaps, a temporary activity of synthetic processes noticeable in the former case.

W. D. H.

The Influence by Salt Ions of Autolysis. LEO BAUER (*Biochem. Zeitsch.*, 1910, 29, 408—413).—In concentrations of $N/10$, the chlorides of the alkaline earths increase the autolysis more than do the salts of the alkalis in the same relative concentration. The action of calcium chloride is more marked than that of the other chlorides of the alkaline earths. Loeb's solution does not increase the rate of action.

S. B. S.

The Stimulating Action of Lipoids on the Action of Liver Diastase. EUGENIO CENTANNI (*Biochem. Zeitsch.*, 1910, 29, 389—394).—Lipoids of egg-yolk, blood, intestine, etc., increase the rate of action of the natural liver diastase from which lipoids had been removed by ether. The lipoids of yeast exerted no action. The lipoids of the liver itself also increased the action. The activating action is not due to the reaction, or to dialysable constituents, and the activating substance is not destroyed by prolonged boiling. The dialysable lipid substances are, however, also capable of reactivating the diastase of the parenchyma which had been extracted with ether.

S. B. S.

Glycolysis. The Oxidative Destruction of Sugar by the Action of Organic Preparations. WALTHER LÖB and GEORG PULVERMACHER (*Biochem. Zeitsch.*, 1910, 29, 316—346).—The organic preparation which stimulated the oxidative destruction of sugar, preparation which stimulated the oxidative destruction of sugar, either by hydrogen peroxide or oxygen, was prepared by precipitating the alcoholic extract of pancreas with iron salts (ferric or ferrous).

It was thought, from the experiments of Minkowski and Cohnheim, that the secretion by the pancreas was an active agent in stimulating the peroxydase of the iron containing blood-pigment; hence the employment of the preparation mentioned. Its action was studied in some detail under varying conditions. Pepsin and pancreatin digestion do not destroy the oxidative properties. It is not entirely stable to heat, although different preparations vary in this respect. Amongst the sugar products isolated were formaldehyde (very small quantities), small amounts of carbon dioxide, and also formic acid and polyhydroxy-acids. Pentose was also found in relatively large quantities. It has not yet been determined whether similar preparations other than those derived from the pancreas exert a like action.

S. B. S.

Physiology of Glands. XVI. The Internal Secretion of the Thyroid and its Formation under the Influence of Nerve-Stimulation. LEON ASHER and MARTIN FLACK (*Zeitsch. Biol.*, 1910, 55, 83-166).—The internal secretion of the thyroid increases the excitability of the depressor nerve, and the activity of adrenaline in raising arterial pressure. The secretory nerves of the thyroid are contained in the laryngeal (especially the superior) nerve. If these nerves are stimulated, the depressor nerve action and the action of adrenaline are increased. Removal of the thyroid abolishes the effect. Injection of iodothyroin does not produce these results, but injection of thyroid extract does; thyroid extract contains other active substances. The great elevation of blood pressure produced by a combination of an excitation of the thyroid's secretory nerves and an injection of adrenaline does not occur when the depressor nerves are cut. The secretion of the thyroid and injection of thyroid extract have in themselves no effect on pulse or blood-pressure. The bearing of these observations on Basedow's disease is discussed.

W. D. H.

The Inhibition of the Action of Chemical Muscle-stimuli by Non-electrolytes. VELVYN E. HENDERSON (*Zentr. Physiol.*, 1910, 24, 519-523).—Non-electrolytes, such as dextrose, sucrose, and mannitol, in the presence of sodium salts were found to inhibit the exciting action of guanidine and oxalic acid on muscle. Moreover, the convulsions of the muscle produced in a mixture of the stimulant and sodium chloride ceased on the addition of the non-electrolytes. The same results were obtained when Ringer's solution was employed in place of sodium chloride. The action is attributed to an exosmosis of the active ions in the presence of the non-electrolyte. W. J. Y.

The Inhibitory Influence of Magnesium on the Direct Excitability of Frog's Muscle, and the Antagonistic Effects of Sodium and Calcium on this Influence. DON R. JOSEPH and SAMUEL J. MELTZER (*Chem. Zentr.*, 1910, ii, 237; from *Zentr. Physiol.*, 1910, 24, 7-8).—Solutions of magnesium sulphate diminish the direct and indirect excitability of frog's muscles to induction shocks. Sodium restores the direct, and calcium after or together with sodium restores

the indirect excitability. If the magnesium salt is injected into the lymph sac, the sodium of the lymph prevents the inhibition of the direct excitability, and the simultaneous injection of calcium chloride restores the indirect excitability.

W. D. H.

The Influence of Different Substances on the Gaseous Exchange of the Surviving Muscular Tissue of Frog's IV.—IX. TORSTEN THUNBERG (*Skand. Arch. Physiol.*, 1910, 24, 23—61, 62—71, 72—74, 75—79, 80—85, 86—89. Compare *Abstr.*, 1910, ii, 54, 523).—The investigations were conducted on the lines of the author's previous work. Thirty-eight organic acids were investigated; although many lessen the gaseous exchange, none act in the specific way, namely, by lessening the output of carbon dioxide, which was previously found to be the result of oxalic, maleic, and succinic acids. Succinic acid produces the most marked effect. Various narcotics and antiseptics lessen the gaseous exchange in varying degrees without altering the respiratory quotient; among the antiseptics, phenol has the greatest, and boric acid the least, effect. Fumaric, malic, and citric acids in very small concentrations increase the amount of anoxybiotic carbon dioxide products; the question arises whether specific enzymes are responsible for their production. Potassium fluoride lessens the gaseous exchange, and, like the organic acids, specially affects the substances that yield carbon dioxide; potassium chloride, bromide and iodide are indifferent substances in this relation. Potassium chlorate has no effect, but the bromate, and especially the iodate, are toxic to muscle. The bromine compounds of succinic, fumaric, and maleic acids act like the dicarboxylic acids in raising the respiratory quotient; in the metabolism of muscle, these acids probably enter the muscle substance.

W. D. H.

The Chemical Conditions Necessary for the Maintenance of the Normal Cell Structure. I. and II. ERIK MATTEO PROCHET WIDMARK (*Skand. Archiv. Physiol.*, 1910, 23, 421—429; 24, 13, 22).—I. Weighed portions of muscular tissue from frogs, finely minced, were allowed to soak in isotonic saline solutions to which varying quantities of solutions of calcium, strontium, barium, and magnesium chlorides were added. The loss of weight undergone by the tissue owing to this treatment was estimated. In the case of calcium chloride, the tissue undergoes its maximal loss of weight (37%) when the calcium chloride attains the concentration of 15 millimols. per litre. Similar results were obtained with barium and strontium chlorides, but the action of magnesium chloride is very much less marked.

II. To account for shrinking of the cell after treatment with calcium salts, it is suggested that the calcium precipitates the phosphates in the interior of the cell. No evidence of this hypothesis could, however, be obtained experimentally, as muscular tissue, from which the greater part of the phosphorus had been removed by washing with isotonic saline solution, also showed loss of weight on treatment with calcium salts. Furthermore, if citrates are added in addition to the calcium salts to prevent precipitation of phosphate, loss of weight also took place.

S. B. S.

The Reducing Action of the Tissues. WALTER STRASSNER (*Biochem. Zeitsch.*, 1910, 29, 295—310).—The author has measured the reducing action of tissues on methylene-blue, using the method of Knecht and Hibbert (titanium chloride method) for estimating the dye. The author draws the conclusion that the reducing action is due to the sulphhydryl group in the tissues, in spite of the facts that heating, autolysis, and hydrocyanic acid diminish the reducing action. He shows, however, that hydrocyanic acid also diminishes the reducing action of thiolacetic acid, and suggests that autoxidation or heating may destroy the sulphhydryl group. Starvation, phosphorus poisoning, and other actions which produce fatty tissues diminish the reducing capacity of the tissues, which is unaffected, however, by poisoning with mercuric chloride, chloral hydrate, and other drugs.

S. B. S.

The Staining of Fat by Nile-blue Sulphate. J. LORRAIN SMITH (*J. Path. Bact.*, 1910, 15, 53—55).—When the fat in the human tissues is neutral, Nile-blue sulphate colours it red; but if the fat contains much fatty acid, the globules take a colour compounded of blue and red in variable proportions. The blue staining of the fatty acid is due to the union of the colour base (oxazine) with the acid in the form of a soap-like compound. As a rule, lipoids contain fat in a neutral form, but hydrolysis readily occurs, and so blue staining may be obtained. The red substance, as Thorpe showed (*Trans.*, 1907, 93, 324), is not present in the Nile-blue sulphate in dry powder, but it appears in aqueous solutions of the dye, because the oxazine base spontaneously oxidises into oxazone; in the same way, it imparts a red colour to liquid neutral fat. Some confusion has arisen in the work of recent investigators, as they have regarded the oxazine base and the oxazone as the same thing, and in accordance with this assumption they have applied to the double staining of fat the theory of metachromatism by the base set free in aqueous solution by hydrolytic dissociation. Such conclusions are unwarranted.

W. D. H.

The Resorption of Cholesterol and Cholesteryl Esters. H. A. KLEIN and ADOLF MAGNUS-LEVY (*Biochem. Zeitsch.*, 1910, 29, 465—471).—The authors investigated the amount of cholesterol in the faeces of a dog on a fixed diet to which were added cholesterol and cholesteryl oleate. It was found that a somewhat larger proportion of the former was resorbed than of the latter. Various data are given as to the amount of cholesterol in eggs, butter, brain, and other substances, and the suggestion is made that the synthesis of cholesterol in the animal body can be investigated by estimating the amount formed in fowl's eggs when the birds are kept on diets containing varying amounts of cholesterol.

S. B. S.

The Occurrence of Deoxycholic Acid in Gall Stones. WILLIAM KÜSTER (*Zeitsch. physiol. Chem.*, 1910, 69, 463—465).—The occurrence of deoxycholic acid in the gall stones of oxen was regarded as probable, seeing that it is so easily derived from cholic acid by reduction. Evidence is adduced to show that this is the case. W. D. H.

The Alteration in the Excretion of Amino-acids or Substances Titratable with Formaldehyde as a Cause of the Increase in the Cal. : N Ratio after Great Loss of Blood. DIONYS FUCHS (*Zeitsch. physiol. Chem.*, 1910, 69, 482—490).—The amount of amino-acid nitrogen in the urine (dog and rabbit) is increased by great loss of blood, both absolutely and relatively to the total nitrogen. The condition does not again become normal until three weeks later. A second bleeding produces a still more marked effect. There is no special effect on ammonia excretion. The increase in the Cal. : N ratio (energy quotient) is, in part at least, due to the rise of amino-acid excretion.

W. D. H.

The Influence of Prolonged Inanition on the Excretion of Amino-acids or Substances Titratable with Formaldehyde. DIONYS FUCHS (*Zeitsch. physiol. Chem.*, 1910, 69, 491—495).—In the later stages of inanition the amount of amino-acid nitrogen in the urine rises absolutely, but not relatively, to the total nitrogen; the ante-mortem rise of total nitrogen is therefore not to be attributed to the increased excretion of amino-acids. Lactic acid and other fatty acids increase at this stage, and ammonia usually falls. W. D. H.

A Yellow Substance in the Urine. L. DE JAGER (*Zeitsch. physiol. Chem.*, 1910, 70, 60—64).—A yellow precipitate is produced in the urine by the addition of hydrochloric acid and formaldehyde. It contains neither urobilin nor urochrome, but appears to be a compound of urea.

W. D. H.

The Detection and Formation of Aromatic Substances in the Body. II. The Behaviour of Indole and Seatoles in Rabbits. FERDINAND BLUMENTHAL and ERNST JACOBY (*Biochem. Zeitsch.*, 1910, 29, 472—487).—To account for the presence of indole in the urine of starving rabbits, which has been assigned, amongst other causes, to hemorrhage, to delay of faeces in the intestine during starvation, and consequent putrefaction, etc., the authors have tested the contents of the intestines of rabbits when fed and during starvation. They find that the tests with ether or benzol extracts of faeces are untrustworthy, probably owing to extraction of urobilinogen and other causes, but that satisfactory results are obtained with the Ehrlich, vanillin, and heliotropin reactions with the aqueous distillates from faeces. In the case of fasting animals, the contents of the large, but not of the small, intestine contain indole, and in the case of fed animals the latter also sometimes contains phenol. After injection of indole and seatoles, indole substances are found in the contents of the alimentary tract. In view of Jaffe's investigations on the supposed indole-3-carboxylic acid in normal urines, the urines of fed and starving rabbits were also investigated, and indole-yielding substances (obtained on distillation of the urine) were found in the urine of both, but more especially in those urines in which the indican reaction was positive. S. B. S.

The Oxydase Reaction in Myeloid Tissues. JOHN SHAW DCXX (*J. Path. Bact.*, 1910, 15, 20—30).—The oxidising property of

leucocytes was first pointed out by Vitali in 1887, when he showed that pus added to tincture of guaiacum produces a blue reaction without the addition of hydrogen peroxide; this property is destroyed by heat. The precipitate obtained by adding alcohol to a chloroform extract of pus has the same power, so also have organs rich in granular leucocytes, such as bone-marrow, but not purely lymphocytic organs like lymph glands or thymus (Brandenburg). The blood in myelogenous leucæmia has the same property, and as it belongs only to granular leucocytes, the reaction may be used in diagnosis (E. Meyer).

In the present research it is shown that the synthesis of indophenol from α -naphthol and p -phenylenedimethyldiamine is produced with great rapidity, as shown by the microscopic examination of blood films, by the polynuclear and eosinophile leucocytes, fairly rapidly by hyaline leucocytes, and by the myelocytes of marrow and in leucæmic blood. It is produced less readily by basophile leucocytes, but not by lymphocytes, red corpuscles, or by normal tissue elements, with the exception of parotid and lacrimal gland epithelium. The occurrence of the reaction in large hyaline leucocytes confirms Ehrlich's view that they originate in bone-marrow. The oxidising substance exhibits considerable resistance to heat, and its effects can therefore be observed in most cases in tissues submitted to the paraffin method of imbedding, but it is desirable in the investigation of the more embryonic forms of myeloid cells that unfixed films or sections should be examined also.

W. D. H.

The Wassermann Reaction in Rabbits Infected with the Trypanosomes of Nagana, and the Effect of Treatment with Arsenophenylglycine (Ehrlich). CARL H. BROWNING and I. MCKENZIE (*J. Path. Bact.*, 1910, 15, 127—128).—No safe conclusion as to the action of pathogenic protoza can be based on the Wassermann reaction in the case of rabbits; for instance, normal rabbits may give a positive reaction. This and other irregularities are fairly common in the lower animals. Arsenophenylglycine is a therapeutic agent of high efficiency in trypanosome infections in rabbits.

W. D. H.

The Behaviour of p -Hydroxyphenyl Lactic Acid and p -Hydroxyphenylpyruvic Acid in the Animal Body. YASURO KOTAKE (*Zeitsch. physiol. Chem.*, 1910, 69, 409—419).—*l*- and *d*- p -Hydroxyphenyl-lactic acids are almost completely unchanged in the body, and are excreted unchanged in the urine; p -hydroxyphenylpyruvic acid is almost completely destroyed. This agrees well with Neubauer's work and views on alcaptonuria.

W. D. H.

The Physiological Action of an Ergot base, and of 4- β -Aminoethylglyoxaline. FRIEDRICH KUTSCHER (*Chem. Zentr.*, 1910, ii, 327—328; from *Zentr. Physiol.*, 1910, 24, 163—165).—The bases precipitable by silver nitrate from extract of ergot are separable into two fractions, one precipitable by ammonia and silver nitrate, the other precipitable by silver nitrate and barium hydroxide. From the first fraction, the picrolonate and the chloride (as hygroscopic crystals) were

prepared; this base gives Pauly's diazo-reaction, but not the biuret reaction. It causes lowering of the blood-pressure in rabbits, heart slowing, and stoppage of respiration; a few milligrams are fatal. In this it differs from histidine, which is physiologically inactive, and from 4- β -aminoethylglyoxaline, which causes a rise of blood-pressure, and is much less toxic.

W. D. H.

[Poisonous Action of Sodium Chloride on Sea Urchin's Eggs.] OTTO WARBURG (*Zeitsch. physiol. Chem.*, 1910, 69, 496—497; *Biochem. Zeitsch.*, 1910, 29, 414—415).—Polemical in regard to the work of Jacques Loeb and Wasteneys (Abstr., 1910, ii, 1096).

W. D. H.

The Behaviour of Lead Compounds in the Human Stomach. THOMASON (*Chem. Zentr.*, 1910, ii, 328—329; from *Sprechsaul*, 1910, 43, 325—327).—The effect of dilute (0·15 to 0·25%) hydrochloric acid on white lead and lead glaze at body temperature in the presence and absence of foods and pepsin was investigated. The percentage solubility of white lead in the stomach increases with a lessening of the food present; the solubility of lead is inversely proportional to the amount of protein, and directly proportional to the amount of hydrochloric acid present.

W. D. II.

Toxicity of Some Inorganic and Organic Arsenic Compounds and Tolerance to these Poisons. L. LAUNOV (*Compt. rend.*, 1910, 151, 897—899).—The percentage of arsenic was determined in a number of compounds of the element, and the toxic dose for guinea-pigs found when the substances were administered by injection through the peritoneum. The following list shows the weight of arsenic in grams per kilogram of body-weight required to kill the animal in one to ten days: sodium arsenate, 0·006—0·012; sodium thiarsenate, 0·00875; sodium thiotrioxarsenate, 0·00091; sodium thiocyanate, 0·09125; sodium thiocacodylate, 0·07131; sodium methylarsinate, 0·0254; sodium thiomethylarsinate, 0·0256; atoxyl, 0·0418; thioatoxyl, 0·0221; acetylatoxyl, 0·0461; acetylthioatoxyl, 0·0266; colloidal arsenic, 0·0083.

It was not found possible to establish tolerance to arsenic by prolonged administration of atoxyl in small doses.

W. O. W.

Chemistry of Vegetable Physiology and Agriculture.

Biochemistry of Micro-organisms. IV. The Fermentation of Formic Acid by *Bacillus Kiliense*. HARTWIG FRANZEN and G. GREVE (*Zeitsch. physiol. Chem.*, 1910, 70, 19—59. Compare Abstr., 1910, ii, 799).—Protocols are given in full to illustrate the action of the *Bacillus Kiliense* in the fermentation of formic acid; its activity is compared with that of the bacilli previously investigated.

W. D. H.

New Method for Detecting Reducing and Oxidising Properties of Bacteria. W. H. SCHULTEZ (*Centr. Bakter. Par.*, 1910, i, 56, 544—551).—Reductase-agar is prepared as follows: Concentrated aqueous sodium hydroxide is added drop by drop to 100 c.c. of boiling water containing 1 gram of α -naphthol until the latter is dissolved. On cooling, more sodium hydroxide is added until the solution again becomes clear and light brown in colour. The solution is then mixed with a 1% solution of p -nitrosodimethylaniline (equal vols.), filtered, and mixed with about two-thirds the volume of ordinary nutritive-agar (liquid) and poured into Petri-dishes.

Oxydase-agar is prepared by adding a well-filtered mixture of equal volumes of 1% α -naphthol solution (prepared as described above) and 1% p -phenylenedimethyldiamine hydrochloride to liquefied nutritive-agar (about 3 parts). As the preparation becomes blue in a few hours, it must always be freshly prepared.

The oxydase-agar may be employed for showing the oxidising action of liquids, such as saliva, etc.

N. H. J. M.

Mobilisation of the Phosphoric Acid of Soils under the Influence of Bacteria. S. A. SEWERIN (*Centr. Bakter. Par.*, 1910, ii, 28, 561—580).—The experiments were made with soil (1100 grams) to which finely-ground phosphorite (10 grams) was added. After being sterilised, the soil was inoculated and kept for two months, and the soluble phosphoric acid determined. During the whole time air was passed through the flasks, and the amount of carbon dioxide produced estimated.

As regards the production of soluble phosphoric acid, the results were negative, the amount of readily soluble phosphoric acid being diminished. There was a considerable production of carbon dioxide, ten to twenty times as much as in sterilised soil.

The disappearance of readily soluble phosphoric acid is attributed partly to its assimilation by the bacteria and partly to purely chemical changes. This does not exclude the possibility that a smaller amount of insoluble phosphoric acid may have been rendered soluble.

N. H. J. M.

The Formation of Trimethylamine by *Bacterium prodigiosum*. D. ACKERMANN and H. SCHÜTZE (*Chem. Zentr.*, 1910, 2, 756; from *Zentr. Physiol.*, 1910, 24, 210—211).—Trimethylamine can be obtained from cultures of *B. prodigiosum* grown on potatoes. Its parent substances are choline and lecithin. By the addition of choline or lecithin, the yield of trimethylamine is increased up to twenty-fold. Betaine has no influence. In cultures on peptone-agar, no trimethylamine is formed, but it occurs when choline is added. *B. vulgaris* on potatoes yields no trimethylamine even if choline is added also.

W. D. H.

Action of the Bulgarian Ferment on Proteins and Amino-compounds. JEAN EFFRONT (*Compt. rend.*, 1910, 151, 1007—1009).—The Bulgarian ferment contains an enzyme capable of effecting a more profound decomposition of casein than results from the action of

pepsin or tryp-sin. The liberation of ammonia has been demonstrated when the ferment acts on asparagine, milk, or Witte's peptone in presence of calcium carbonate, in the latter case the amount set free corresponding with 40% of the total nitrogen.

In the author's opinion the value of the Bulgarian ferment in the treatment of gastro-intestinal disorders depends on its ability to decompose proteins rather than on the lactic acid it produces.

W. O. W.

Biological Degradation of Carbohydrates. AUGUSTE FERNBACH (*Compt. rend.*, 1910, **151**, 1004—1006).—Starch is readily hydrolysed by *Typhothrix tenius* whether the micro-organism is present *in vitro* or as a maceration. The successive products are maltose, dextrose, and dihydroxyacetone. When the organism is cultivated in a medium containing glycerol, the triol undergoes oxidation to dihydroxyacetone, methylglyoxal, and two decomposition products of the latter, namely, acetic acid and formaldehyde. These are also met with in the later stages of the hydrolysis of starch and sucrose, and probably arise from the action of bacterial secretions.

W. O. W.

The Behaviour of Yeast Gum in Autolysis and in Alcoholic Fermentation. ERNST SALKOWSKI (*Zeit. physiol. Chem.*, 1910, **69**, 466—471).—After autolysis and alcoholic fermentation, yeast still contains much of the gum, but quantitative experiments are not given to determine the amount which disappears.

W. D. H.

Chemical Disinfectants. SHERIDAN DELÉPINE (*J. Soc. Chem. Ind.*, 1910, **29**, 1344—1354).—The factors influencing the efficiency of a large number of substances used as disinfectants as regards (1) their power of inhibiting the activity of bacteria, (2) their bactericidal action, are enumerated and discussed.

It is pointed out that certain substances even in minute amounts have the property of arresting the multiplication and other activities of bacteria, and may be called antiseptics, but that the same materials in larger quantities may kill bacteria and are then appropriately named disinfectants. Illustrations are given of substances, such as mercuric chloride, which may act in both ways, time of exposure and concentration of solution, apart from the nature and resisting power of the bacteria, being the chief factors which determine whether the substance is merely inhibitory or lethal. It is well known that different bacteria show different powers of resistance towards disinfectants, and that, in general, the spores of a bacillus are far more resistant both to heat and to bactericidal agents than the bacillus itself, but it is also the case that different individuals in a pure bacillus culture exhibit different powers of resistance. A series of tests with phenol on cultures of *Bacillus coli* showed that younger cultures were more resistant than older ones, although after some time the resistance became almost constant or diminished very slowly. The drying of *Bacillus coli* by exposure to air at 14—18° had little effect on its resistance to phenol until about the seventeenth day, when the resistance began to diminish. The material associated with

the bacteria and the disinfectant has an important influence on the efficiency of the latter. It is shown that certain substances, which when present in sufficient quantity act as disinfectants, act as stimulants to the growth of bacteria when present in minute amounts.

T. A. H.

The Importance of the Temperature Factor in the Determination of the Rate of the Activity of Certain Disinfectants. R. R. FASSON, C. W. PONDER, and G. SIMS WOODHEAD (*J. Path. Bact.*, 1910, 15, 131–133).—The experiments were made with emulsified disinfectants derived from coal-tar (cresols, etc.), as compared with carbolic acid. Dose and time of action are important factors in estimating their activity, but temperature also must be taken into account. At lower temperatures the activity of the emulsion is raised more rapidly than that of the solution, but at the higher temperatures used the activity of the emulsion is no longer increased in proportion to the increase in the activity of the carbolic acid.

W. D. H.

The Sterilisation of Chalk Waters by the Use of Minute Quantities of Bleaching Powder. G. SIMS WOODHEAD (*J. Path. Bact.*, 1910, 15, 130–131).—The activity of bleaching powder in the destruction of bacteria of the *Coli* group is very great, and large quantities are quite unnecessary. The amount of chlorine necessary to kill the whole of the non-sporulating bacilli in Cambridge water is usually one part per seven million parts of water. Various details on the method are added.

W. D. H.

The Disinfecting Power of Complex Organo-mercury Compounds. I. Aromatic Mercurycarboxylic Acids. WALTHER SCHRAUTH and WALTER SCHOELLER (*Zeitsch. Hyg. Infect.*, 1910, 66, 497–504).—The disinfecting power of a number of derivatives of sodium hydroxy-o-mercurobenzoate, $\text{OH}\cdot\text{Hg}(\text{C}_6\text{H}_4\cdot\text{CO}_2\text{Na})_2$, was compared in order to ascertain the effect of the introduction of various groups on this property. It was found that by substituting the hydroxy-group by groups having a stronger affinity for silver, such as iodine, cyanogen or veronal, the disinfecting power was decreased. With sulphur, it was still further decreased, whilst the power was almost entirely lost in compounds in which both valencies of the mercury were attached to the benzene ring, such as in sodium mercurodibenzoate, $\text{Hg}(\text{C}_6\text{H}_4\cdot\text{CO}_2\text{Na})_2$.

W. J. Y.

The Pentosan Content of Various Fungi. J. L. WICHERS and BERNHARD TOLLENS (*J. Landw.*, 1910, 58, 238–242).—Various fungi growing on wood were examined and found to contain pentosans and, in some cases, methylpentosans. The amount varied from 2·5% in *Trametes odorata* to 6·7% in *Lenzites flaccida*; methylpentosans were found also in *Xylaria polymorpha* and *Fomes fomentarius*. Estimations made at the same time by the quicker method of Büddener and Tolleins (see this vol., ii, 75), always gave rather lower results.

E. J. R.

Occurrence of Aucubin in *Garrya* spp. HENRI HÉRISSEY and C. LEBAS (*J. Pharm. Chem.*, 1910, [vii], 2, 490–494).—The glucoside

aucubin was first isolated from *Aucuba japonica* (Abstr., 1909, i, 634), and has since then been recorded by Bourdier (*Thèse*, Paris, 1908) in *Plantago* spp. In the present investigation, it was isolated, not quite pure and in small amount, from the stem and leaves of *Garrya elliptica*, *G. mucrophylla*, and *G. Thureti*. T. A. H.

The Carbohydrates of White Pepper. K. H. BÖDDENER and BERNHARD TOLLENS (*J. Landw.*, 1910, **58**, 229—231).—It has already been shown that white pepper, in addition to its 54% of starch, 1% of ethereal oil, and 4 to 9% of piperin, contains also pentosans and methylpentosans, or at least substances that give furfuraldehyde and methylfurfuraldehyde on distillation with hydrochloric acid. The authors have endeavoured to investigate further these pentosans, but without success. The methods used for separating the piperin and the starch with its transformation products removed also the greater part of the pentosans, so that the amount remaining after the final purification was too small for separation. E. J. R.

The Root of the Kermek (Statice, Plumbaginaceae). G. POVARIN and A. SEKRETEFF (*J. Russ. Phys. Chem. Soc.*, 1910, **42**, 1024—1034).—The root of the kermek (*Statice Cmedinae*) contains tannides 15·70%, sugars 2·03%, soluble substances 30·15%, non-tanning substances 14·45%, water 10·76%, ash 4·23%, resins 0·34%, some amine (probably alkaloids), a trace of gallic acid, possibly some phloroglucinol, and a glucotannide. Kermek and similar tanning roots should be analysed as far as possible without access of air: The tanning substances in the root are readily oxidised, and consist of at least two tannides, red and yellow, which can be distinguished by the differently coloured lead, calcium and barium salts; the tannides also give characteristic reactions with silver and cadmium nitrates, formic acid and concentrated sulphuric and hydrochloric acids. On dry distillation, the tannides yield pyrogallol.

Violuric acid is recommended as a reagent for the detection of basic substances in plants. Z. K.

The Death of Plants at Low Temperatures. A. A. RICHTER (*Bull. Acad. Sci. St. Petersburg*, 1910, 1251—1260).—*Aspergillus niger* when exposed to very low temperatures ceases to evolve carbon dioxide, and loses all the properties of living protoplasm, neither does it regain these at 18—19°; but it revives rapidly at 30—32° even if it had previously been frozen at the temperature of a mixture of ether and solid carbon dioxide. Z. K.

Effect of Road Tarring on Vegetation. MARCEL MIRANDE (*Compt. rend.*, 1910, **151**, 949—952. Compare Abstr., 1910, ii, 881).—The vapour of hydrocarbons arising from tar or asphalt exercises an injurious action on vegetation, producing blackening of the leaves, characteristic of death of the protoplasm. The effects observed are not due to actual contact with particles of tar, since these, in common with solid hydrocarbons, such as naphthalene or anthracene, have very little action when applied to plants in the state of fine powder. W. O. W.

Influence of Different Volatile Substances on Higher Vegetation. HENRI COUPIN (*Compt. rend.*, 1910, 151, 1066—1067).—The author classifies forty-seven aliphatic and aromatic volatile substances into five groups, according to their relative toxicity towards germinating wheat.

The action of the same compound differs in intensity with different plants. The grains are more open to attack at the earlier stages of germination than when the aerial organs have attained development.

W. O. W.

The Presence of Arginine and Histidine in Soils. Pyrimidine Derivatives and Purine Bases in Soils. OSWALD SCHREINER and EDMUND C. SHOREY (*J. Biol. Chem.*, 1910, 8, 381—384, 385—393).—In soils, the products of cleavage of proteins of vegetable origin can be separated out. Those identified in the present research were arginine and histidine in variable proportions, cytosine, xanthine, hypoxanthine and picolinecarboxylic acid.

W. D. II.

Calcium or Sodium Nitrate [as Manure]. PAUL WAGNER (*Bied. Zentr.*, 1910, 39, 729—731; from *Mitt. deut. landw. Ges.*, 1910, St. 8, 107—109).—In field experiments with mangolds, winter rye, and barley, somewhat higher yields were obtained with sodium nitrate than with calcium nitrate, whilst in the case of sugar beet, potatoes, and oats, the yields were rather higher when calcium nitrate was employed.

N. H. J. M.

Manurial Action of Ammonium Sulphate in Conjunction with Sodium Chloride. BERNHARD SCHULZE (*Bied. Zentr.*, 1910, 39, 731—733; from *Mitt. deut. landw. Ges.*, 1910, St. 30, 452—458).—It is shown by field experiments that when sodium chloride is applied along with ammonium sulphate, the manurial value of the ammonium salt becomes about equal to that of sodium nitrate.

N. H. J. M.

Employment of Nitrogenous Manures for Sugar Beet. B. ERBEN, FR. PRACHFELD, and W. VILIKOVSKY (*Bied. Zentr.*, 1910, 39, 782—783; from *Mitt. landw.-botan. Versuchsstät. Tabor*).—Moderate amounts of sodium nitrate increased the yield of roots, whilst larger amounts only increased leaf production. Calcium nitrate gave almost the same results as sodium nitrate.

Calcium cyanamide only increased the yield slightly, and liquid manure had less effect than sodium nitrate.

In moderate amounts, nitrogenous manures had no, or very slight, injurious effect on the amount of sugar in the roots, and had no effect on the amounts of non-sugars.

N. H. J. M.

Analytical Chemistry.

Photochemical Reactions in Laboratory Work. KURT GEBHARD (*Chem. Zeit.*, 1910, 34, 1269).—The author points out that whilst a slightly acid solution of potassium iodide in starch mucilage remains colourless in the dark, it rapidly becomes coloured in the light, due to liberation of iodine, although in presence of a fourth substance liberation of iodine may occur more rapidly in the dark than in the light. This and observations recorded by others (for example, Gibbs, Abstr., 1909, i, 640, and Batik, 1910, i, 543) indicate that as the result of unsuspected photochemical reactions, errors may often be caused in ordinary laboratory work.

T. A. H.

Several Acids Suitable for Use as Standards in Acidimetry. JOSEPH H. KASTLE (*Amer. Chem. J.*, 1910, 44, 487—493).—*p*-Nitrotoluene-*o*-sulphonic acid (Kastle, this vol., i, 30), and *p*-aminosulphobenzoic acid and potassium *o*-nitro-*p*-sulphobenzoate (Hart, Abstr., 1881, 1144) are recommended as standards for use in acidimetry. The last two are anhydrous, and can be thoroughly dried without risk of decomposition. *p*-Nitrotoluene-*o*-sulphonic acid, although crystallising with $2\text{H}_2\text{O}$, is a definite and very stable compound. All these substances are stable in the air, are not hygroscopic or deliquescent, and give very sharp end-reactions with phenolphthalein.

E. G.

Use of Metallic Potassium in Estimating the Halogens in Benzene Derivatives. C. H. MARYOTT (*Amer. J. Sci.*, 1910, [iv], 30, 378—380).—Stephanoff (Abstr., 1907, ii, 50) proposed to estimate the halogens by treatment with alcohol and metallic sodium. The author did not get satisfactory results, but on substituting potassium for sodium, a complete reduction was effected. About 0·4 gram of the substance is placed in an Erlenmeyer flask, and 10—15 c.c. of alcohol-benzene mixture are added (1 vol. of 98% alcohol with 2 vols. of benzene free from sulphur compounds). About ten times the theoretical amount of potassium is now added gradually in small pieces. When the action slackens, two extra c.c. of alcohol are added, and when the potassium has completely dissolved, the whole is shaken with water. The aqueous layer is then acidified with nitric acid, and the halogen is precipitated with silver nitrate as usual.

L. DE K.

Estimation of Total Sulphur in Urine. W. DENIS (*J. Biol. Chem.*, 1910, 8, 401—403).—Benedict's method (Abstr., 1909, ii, 827), in which the oxidising agent is a mixture of copper nitrate and sodium or potassium chlorate, was compared with Folin's sodium peroxide method. The former method leads to spattering and loss, due to too rapid evolution of nitrogen oxides. It can be modified, and the spattering avoided by mixing the copper salt solution with sodium

chloride and ammonium nitrate; the results then are very near to those obtained by Folin's method.

W. D. H.

Benedict's Method of Estimating the Total Sulphur in Urine. CARL L. A. SCHMIDT (*J. Biol. Chem.*, 1910, **8**, 423—425. Compare *Abstr.*, 1910, ii, 827).—Benedict's and Folin's methods gave practically the same results. The presence of sugar makes no difference, but albumin causes the oxidation by Benedict's method to be violent; it makes no difference in Folin's method.

W. D. H.

Estimation of Sulphur in Organic Compounds. THEODOR SR. WARUNSIS (*Chem. Zeit.*, 1910, **34**, 1285—1286).—0.2—0.4 Gram of the finely powdered substance is mixed in a spacious silver or nickel crucible with 10 grams of powdered pure potassium hydroxide and 5 grains of sodium peroxide by means of a silver wire. After covering the crucible with a lid, the mixture is heated for some fifteen minutes in an air-bath at 75—80°, and then heated over a gradually increased flame until it has melted completely. The mass is then allowed to cool, and dissolved in water, solution of bromine in hydrochloric acid is added, and the liquid filtered and boiled to expel the excess of bromine. In the filtrate, the sulphuric acid is estimated as usual.

A blank experiment should be made to allow for any sulphate present in the reagents or sulphuric acid absorbed from the gas employed.

L. DE K.

Estimation of Sulphur and Phosphorus. CHARLES G. L. WOLF and EMIL ÖSTERBERG (*Biochem. Zeitsch.*, 1910, **29**, 429—438).—The authors have investigated various methods for the estimation of sulphur in tissues. They show that satisfactory results can be obtained by preliminary oxidation of the organic matter, and completion of this process by the reagent originally suggested by Benedict containing copper nitrate and potassium chlorate. They show also, that after destruction of the organic matter and precipitation of the sulphato in this way, the phosphorus can be estimated in the filtrate, so that only one sample is necessary for the estimation of both sulphur and phosphorus.

S. B. S.

Remarks on the Iodometric Titration of Acids and Kjeldahl's Nitrogen Estimation. R. KOEFORD (*Zeitsch. physiol. Chem.*, 1910, **69**, 421—440).—Correct results are obtained by strictly adhering to the procedure given. The ammoniaal distillate is collected in a flask containing 15 c.c. of *N*-sulphuric acid until the total volume measures 100 c.c. When making the check, 15 c.c. of the acid are diluted up to 100 c.c. with water previously boiled. Ten c.c. of 5% potassium iodide, 2 c.c. of 2% starch solution (saturated with sodium chloride), and finally, 4 c.c. of 4% potassium iodate are added. The iodine liberated, which represents the free acid, is then titrated with *N*/10-sodium thiosulphate, which operation should occupy just two minutes.

The author has tried the various chemicals from time to time proposed as standards, including glycine and hippuric acid after conversion into ammonium sulphate by Kjeldahl's process. The results

which are tabulated, do not differ much, except those with glycine and hippuric acid, which give somewhat higher figures.

In most cases, Kjeldahl's original process (use of potassium permanganate) is recommended; in such cases where there is danger of formation of piperidine rings, the Gunning modification (use of potassium sulphate) is more appropriate.

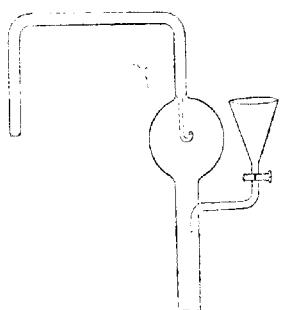
L. DE K.

Error in Estimating Nitrogen in Soil. EILHARD A. MIRSCHENLICH and ERNST MERRES (*Chem. Zentr.*, 1910, ii, 495; from *Landw. Jahrb.*, 1910, 39, 345-367).—In soil sampling, a sample should be taken by means of a borer from each square metre; according to the soil, the error will vary from ± 4 to 6% . The error due to changes during the drying of soils in the air can be avoided by adding tartaric acid. Soil extracts should be kept under carbon dioxide.

N. H. J. M.

Distillation Arrangement for Ammonia and Nitrogen Estimations. CARL MÜLLER (*Chem. Zeit.*, 1910, 34, 1308).—The apparatus (see figure) is placed on the distilling flask, and the reducing agent and the sodium hydroxide solution are admitted through the funnel. In this manner there is no loss of ammonia to be feared owing to gases given off, as these have to pass through the acid in the receiver.

L. DE K.



Folin's Method for the Estimation of Urinary Ammonia Nitrogen. MATTHEW STEEL (*J. Biol. Chem.*, 1910, 8, 365-379).—Compare Abstr., 1908, ii, 776.—In urines containing large quantities

of ammonio-magnesium phosphate, there is in Folin's method an incomplete decomposition of this substance, and so the yield of ammonia is too low; the error may exceed 50%. Some alkali must be added which will liberate all the ammonia from the phosphate but not from other substances, such as urea. The plan adopted is to substitute sodium hydroxide for sodium carbonate. If plenty of sodium chloride is added also, urea and other substances are not decomposed. For the 3 grams of sodium carbonate employed by Folin, 0.5 to 1 gram of sodium hydroxide plus 15 grams of sodium chloride are substituted.

W. D. H.

Nitrometer Appendage Flasks. FRANZ MICHEL (*Chem. Zeit.*, 1910, 34, 1237).—The H-vessel (see figure), which dispenses with the use of the pipettes and funnels, is used as follows: Tube a, which for nitrogen estimations carries two marks at 25 and 50 c.c. respectively, contains the alkaline hypobromite solution. Tube b also carries two marks of 5 and 10 c.c. respectively, and is intended for the substance

to be tested. The diameters of the tubes are so chosen that their length is about equal. If a solid substance, such as an ammonium salt, has to be tested, a weighed quantity is placed in tube *b*, and water is added up to the desired mark. Liquids are introduced up to the desired mark, or may be delivered from a pipette. After closing the tubes (*a* with a rubber cork, *b* with a stopcock tube), the pressure in both tubes is equalised as usual. To start the reaction, the apparatus is inclined in such a manner that the liquid from *b* gradually enters *a*, and when the effervescence has ceased, the liquid is allowed to again enter *b*, and this operation is repeated a few times. When all the liquid is once more in tube *a*, the apparatus is placed in a horizontal position, *a* downwards, and well shaken. In this manner it is impossible for any liquid to enter the stopcock tube. L. DE K.

Application of Busch's "Nitron" Method to the Analysis of Chili Saltpetre. LEOPOLD

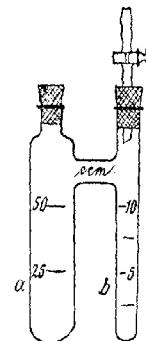
KARLBERGER (*Clem. Zentr.*, 1910, ii, 685, 686; from *Osterr. ung. Zeitsch. Zucker-Ind. Landw.*, 1910, 39, 433—436).—Busch's method (*Abstr.*, 1905, ii, 282) may be employed for estimating the quantity of nitrate in Chili saltpetre provided that this contains not more than the normal amount of perchlorate. If the salt contains a large amount of perchlorate, the results obtained by the process are untrustworthy.

W. P. S.

Analysis of Nitrates by Grandval and Lajoux's Method. Estimation of Nitrates in Water by a Sulphosalicylic Reagent. HUBERT CARON and DÉSIRÉ RAQUET (*Bull. Soc. chim.*, 1910, [iv], 7, 1021—1025, 1025—1027).—In the first paper the modified form of Grandval and Lajoux's process introduced by Perrier and Farcy (*Abstr.*, 1909, ii, 344) is criticised, and in the second the use of a solution of salicylic acid in sulphuric acid is suggested in place of phenol dissolved in sulphuric acid as a colorimetric reagent for nitrates.

It is stated that the coefficients of decolorisation quoted by Farcy (*Abstr.*, 1909, ii, 616) do not agree with those calculated from the results given in his previous paper (*Abstr.*, 1909, ii, 344). Further, the dry residue from the water is liable to absorb moisture, and unless this is guarded against, different results are obtained by different workers for the same proportion of nitrates. The results obtained vary also with the method used in preparing the solution of phenol in sulphuric acid, and the authors recommend the use of a reagent freshly prepared by dissolving 1 c.c. of the liquefied phenol, specified in the Codex Francais, in 10 c.c. of sulphuric acid.

In the second paper, it is pointed out that several phenolic substances dissolved in sulphuric acid give colours with nitrates, and a solution of from 1 to 5% of salicylic acid in sulphuric acid is suitable



for use in estimating nitrates in water. The process suggested is as follows: Evaporate 10 c.c. of the water to dryness with 1 c.c. of a 1% solution of sodium salicylate; add to the residue 1 c.c. of sulphuric acid, and, after mixing thoroughly for some minutes, add 10 c.c. of water and 10 c.c. of ammonia, and compare the colour given with that furnished by a known nitrate solution similarly treated. The quantity, X , of nitrate in the water is given by the formula:

$$X = Ph/h' \times V'/V,$$

where h and h' are the respective heights of the two solutions giving the same tint in the colorimeter, V and V' the original volumes of the two solutions, and P the amount of nitrate in the standard solution.

T. A. H.

Estimation of Free Carbon Dioxide in Water. J. TILLMANS and O. HEUBLEIN (*Zeitsch. Nahr. Genussm.*, 1910, 20, 617—630).—Titration with calcium hydroxide solution yields trustworthy results, provided that phenolphthalein is used as the indicator. Rosolic acid is quite useless for the purpose, as the hydrogen carbonates of the alkalis and alkaline earths exhibit a strongly alkaline reaction towards this indicator.

W. P. S.

Acid Content of Moor Water. II. STREMME (*J. pr. Chem.*, 1910, [ii], 82, 519—520).—It is pointed out that Eudell in his paper on the acidity of moor waters (*Abstr.*, 1910, ii, 1005) has worked according to the method first given by the author two years ago (*Zeitsch. prakt. Geol.*, 1908, 126).

T. S. P.

Separation of Alumina and Ferric Oxide. PHILIPPE BARBIER (*Bull. Soc. chim.*, 1910, [iv], 7, 1027—1028).—The material is dissolved in the ordinary way, excess of sodium acetate added, and the acids neutralised by sodium hydroxide. A 10% aqueous solution of sodium hyposulphite is then added until the red coloration of the liquid just disappears. The mixture is boiled, when alumina is precipitated as a dense powder, which can be collected and weighed as usual. Iron can be estimated in the filtrate by any of the ordinary methods. Glucina is precipitated with the alumina if present, and can be separated by digesting the precipitate with ammonium carbonate solution during thirty-six hours, when the alumina remains undissolved, and the glucina can be recovered quantitatively by prolonged ebullition of the solution.

T. A. H.

Estimation of Manganese in Steel by the Volhard-Wolf Method. AUGUST KAYSER (*Chem. Zeit.*, 1910, 34, 1225—1226).—One gram of steel is boiled with 25 c.c. of hydrochloric acid, D 1·12. When solution is complete, a 1 gram tablet of compressed potassium chloride is added, and the boiling continued until the odour of chlorine has passed off. The liquid is transferred to a flask, and after precipitating the iron with zinc oxide, avoiding an excess, the hot solution is titrated with potassium permanganate solution (1·9 gram per litre; 1 c.c. = 0·1% of manganese in the sample). When dealing with samples rich in carbon, more potassium chlorate should be used.

L. ne K.

Method of Dissolving Tinstone. ADOLPH GILBERT (*Zeitsch. offentl. Chem.*, 1910, 16, 441—442).—Natural tinstone is much more refractory than artificial stannic oxide towards fusion with alkali. If 0·5—1 gram tinstone is fused with 10—15 grams of sodium hydroxide in a silver crucible, a little finely-powdered wood charcoal being added (50 mg.), a reaction takes place with considerable development of heat, and solution is complete in three to five minutes. The heating must be continued in order to burn off the excess of carbon. All the tin passes into solution in water, iron oxide remaining insoluble. It is desirable to remove copper and sulphur by a preliminary roasting and extraction with hydrochloric or nitric acid. The quantity of carbon used is only a small fraction of that required to reduce the tin oxide.

The reaction has been described by Burghardt (Abstr., 1890, 1027), but has remained unnoticed in the literature. C. H. D.

Precipitation of Vanadic Acid as Silver Vanadate and Estimation of Phosphoric and Vanadic Acids in the Presence of One Another. GRAHAM EDGAR (*Amer. Chem. J.*, 1910, 44, 467—472).—The solution of the alkali vanadate which may contain excess of alkali carbonate, but no other matters precipitable by silver nitrate, is acidified with nitric acid, and boiled to expel carbon dioxide. Dilute sodium hydroxide is then added to the boiling solution until the yellow liquid turns colourless. An excess of $N/10$ silver nitrate is added, and then ammonia to dissolve the precipitate formed, and the excess of ammonia is boiled off; a few fragments of porous tile should be added to prevent bumping. The silver vanadate is collected on a filter, and well washed, and then the excess of silver is estimated in the usual manner by acidifying the filtrate with nitric acid and titrating with $N/10$ -ammonium thiocyanate with ferric nitrate as indicator. One c.c. of silver consumed = 0·00304 gram of vanadic acid.

In the presence of phosphoric acid, this is co-precipitated as trisilver phosphate with the vanadic acid. The latter is then estimated separately by dissolving the precipitate in sulphuric acid and reducing the vanadic acid by boiling with sulphur dioxide. The vanadium is titrated hot with $N/20$ -permanganate and the phosphoric acid is found by an easy calculation. L. DE K.

An Indirect Method for Estimating Columbium and Tantalum. HARRY W. FOOTE and RALPH W. LANGLEY (*Amer. J. Sci.*, 1910, [iv], 30, 393—400).—The process is based on the great difference between the densities of the oxides of columbium (4·552) and tantalum (8·716).

When applied to the mineral stibiotantalite, a sufficiency of the sample is treated with hydrofluoric acid, the solution is largely diluted with water, and the antimony and bismuth are removed by means of hydrogen sulphide; the precipitate is then treated further by the usual process. The filtrate is evaporated to dryness, and the residue heated with sulphuric acid to expel the fluorine. After diluting with water, the solution is made alkaline with ammonia, and the precipitate is collected, washed, ignited, and weighed. After heating over a blast

lamp for an hour, the density of the mixed oxides is determined and their composition ascertained by referring to a table. L. DE K.

A Recent Method for Separating Tantalum and Columbium.
 HARRY W. FOOTE and RALPH W. Langley (*Amer. J. Sci.*, 1910, [iv], 30, 401—402).—Weiss and Landecker (*Abstr.*, 1909, ii, 942) have stated that tantalic acid may be precipitated from its solution in sodium carbonate by means of a current of carbon dioxide; any columbic acid remains in solution, and may be separated by boiling with sulphur dioxide. The authors, however, agree with Rose and with Ostwald that the columbium is almost completely co-precipitated with the tantalum, and that, therefore, this process cannot be employed for their separation.

L. DE K.

Estimation of Both Phenol and *p*-Cresol in Urine. MAX SIEGFRIED and R. ZIMMERMANN (*Biochem. Zeitsch.*, 1910, 29, 368—388).—The method is based on two determinations: (1) the total amount of bromine required to convert the phenol and *p*-cresol in the liquid into tribromophenol and tribromo-*p*-cresol, and (2) the quantity required to convert the phenol into tribromophenol and the cresol into dibromo-*p*-cresol.

Since 6 atoms of bromine are necessary for the formation of either of the tribromo-compounds, whilst that of dibromo-*p*-cresol only requires 4 atoms, the quantities of phenol and *p*-cresol present are readily calculated from the difference between the two determinations. For the first estimation, a modification of Koppeschaar's method is employed. Twenty to 30 c.c. of sulphuric acid (1:1) are added to a measured volume of the liquid contained in a stoppered flask, and a standard solution of potassium bromide and bromate (0.834 gram $KBrO_3$ and 2.97 grams KBr per 1000 c.c.) is run in from a burette, the liquid being continually agitated, until the precipitate collects together into a mass, and the liquid becomes coloured distinctly yellow. At this point, the volume that has been added is noted, and an eighth part of this volume is further run in. The mixture is then shaken at frequent intervals for one hour. It is then filtered through glass-wool into 25 to 30 c.c. of 5% potassium iodide solution, and the iodine liberated titrated with $N/10$ thiosulphate.

The second reaction is carried out with the same quantity of the original liquid, 30 c.c. of 25% hydrochloric acid are added, and the whole diluted to 500 c.c. The volume of the solution of potassium bromate and bromide required to produce a yellow coloration, as previously determined, is then run in, the liquid being gently rotated throughout, and the mixture left without shaking for fifteen minutes. Twenty-five to 30 c.c. of 5% potassium iodide are added, and the flask left for one hour in front of a light. The iodine liberated is titrated with thiosulphate. The method gives good results.

A new tribromo-*p*-cresol was obtained by the action of potassium bromide and bromate on *p*-cresol in the presence of hydrochloric acid, and the subsequent addition of potassium iodide; it crystallises from acetic acid in colourless needles, m. p. 139°. W. J. Y.

An Improvement in Scherer's Reaction for Inositol. ERNST ALBOWSKI (*Zeitsch. physiol. Chem.*, 1910, **69**, 478—481).—A trace of inositol is dissolved in a few drops of nitric acid, a drop of 10% calcium chloride solution added, and then a drop of 1% platinum chloride solution; the whole is carefully evaporated in a porcelain capsule. A red colour develops; on the addition of water it becomes orange; the red returns on heating once more, with a blue tinge; on stronger heating, it becomes a dirty green. Performed in this way, the reaction is more delicate, and the colours more intense. W. D. H.

A Simple Method for the Estimation of Sugar in Blood. JONAS MICHAELIS and PETER RONA (*Zeitsch. physiol. Chem.*, 1910, **69**, 498).—Polemical against K. Moekel and E. Frank (Abstr., 1910, ii, 1116). W. D. H.

Reischauer's Titration Process for the Estimation of Diabetic Urugar. GUSTAV OTTO GOEBEL (*Apoth. Zeit.*, 1910, **25**, 614—615).—Into three separate test-tubes are introduced the usual quantity of Fehling's solution and water, and to each is added an increasing amount of the urine to be tested. After being heated in the boiling water-bath for fifteen minutes, they are cooled rapidly, shaking being avoided. They are now all tested for excess of copper in the following manner: 0·3 gm. of potassium iodide dissolved in a little water is added, and, after gentle shaking, 5 c.c. of dilute sulphuric acid (1:5). Excess copper will be noticed by the formation of cuprous iodide, and a free iodine, which may be recognised by adding starch solution; no notice should be taken of a blue colour appearing gradually. The contents of the tube which show no excess of copper are those where about the right amount of urine has been added, and serve as a guide for a second trial, when a little less urine should be used. L. DE K.

Estimation of Sugar by Safranine. K. A. HASSELBALCH and LINDBEARD (*Biochem. Zeitsch.*, 1910, **29**, 416).—The authors, in reply to Wender's criticism (Abstr., 1910, ii, 1116), maintain that their safranine method for the estimation of sugar (Abstr., 1910, ii, 905) is wrong, in that they so elaborated the details that the reaction can be made quantitatively, and not merely qualitatively. S. B. S.

Polarimetric Estimation of Lactose. H. DROOP RICHMOND (*Nature*, 1910, **85**, 516—517).—Of the many substances which have been proposed for the removal of proteins previous to the polarimetric estimation of lactose in milk, that most commonly used is mercuric oxide, but the author finds that this reagent does not effect complete precipitation of all the proteins present. If the filtrate obtained from milk which has been treated with mercuric nitrate is further treated with phosphotungstic acid, a somewhat voluminous precipitate is obtained, and the optical activity of the solution is increased. In the case of milk itself, the difference in the polarisation, before and after treatment with phosphotungstic acid, is small, but with dried milks and other milk products the difference may amount to several units.

per cent. As, however, the use of mercuric nitrate is so convenient and involves such a small dilution, the author recommends that its use be continued in conjunction with the addition of phosphotungstic acid. The milk should be treated with mercuric nitrate in the usual manner; after the addition of 5% of phosphotungstic acid and 5% of sulphuric acid (1:1), the mixture is filtered, and the filtrate is examined in the polariscope. The readings observed are multiplied by 1.1.

W. P. S.

Estimation of Lactose in the Presence of the Commonly-occurring Sugars. JULIAN L. BAKER and H. F. E. HULFOX (*Analyst*, 1910, 35, 512—514).—The method proposed depends on the fact that brewers' yeast ferments such sugars as dextrose, invert sugar, maltose, and sucrose, whilst lactose is not affected. The estimation is carried out by adding about 0.5 gram of washed brewers' yeast to 100 c.c. of a 2—3% solution of the mixed sugars, allowing fermentation to proceed for seventy hours at a temperature of 27°, then filtering and boiling the solution, and determining its copper-reducing power. If the sugar solution is non-nitrogenous, a small quantity of sterile yeast water or asparagine may be added. Lactose alone appears to be slightly attacked by the yeast, results of experiments showing that from 90—95% of the quantity present is found at the end of the fermentation process, but in the presence of other sugars the loss of lactose is much less. The fermentation must not be prolonged for more than seventy-two hours, as after this period of time bacteria develop, the solution becomes acid in reaction, and the lactose diminishes rapidly. The process is particularly suitable for the estimation of lactose in the presence of flour, for instance, in infants' and invalids' foods; when sucrose is also present, it is advisable to invert this sugar with invertase or citric acid, before proceeding with the estimation of the lactose. The method is not, however, applicable in the case of foods, etc., containing commercial sugars, such as dextrin, maltose, glucose, and the like, as these, even after fermentation in the presence of diastase, leave a residue which reduces Fehling's solution.

W. P. S.

Estimation of Lactose in Milk. VITOUX (*Ann. Falsif.*, 1910, 3, 471—472).—It is shown that the process described by Denigis (treatment of the milk with sodium metaphosphate and hydrochloric acid, filtering, and determining the cupric reducing power of the filtrate) yields results which agree closely with those obtained by the official (French) method of estimating lactose in milk. The latter method is, however, to be preferred for the analysis of milks which have been preserved by the addition of dichromate, as the end-point of the titration with Fehling's solution is not obscured.

W. P. S.

New Method for the Quantitative Estimation of Sucrose in the Presence of other Sugars. ADOLF JOLLES (*Zeitsch. Nahr. Genussm.*, 1910, 20, 631—638).—The method is based on the fact that sugars, such as arabinose, rhamnose, dextrose, levulose, galactose, mannose, invert sugar, maltose, and lactose, are rendered optically

inactive when heated in dilute alkaline solution, whilst sucrose remains unaffected. The reaction to some extent depends on the concentration of the sugar and alkali; for instance, a 1% dextrose solution containing sufficient sodium hydroxide to render the alkalinity of the whole approximately $N/100$ becomes optically inactive after being heated at a temperature of 37° for twenty-four hours. The solution, however, then becomes acid in reaction, and to avoid this, it is recommended that the solution have an alkalinity approximately $N/10$ and contain not more than 2% of the above-mentioned sugars; the quantity of sucrose present does not matter. Instead of heating at 37° for twenty-four hours, the mixture may be boiled in a reflux apparatus or heated in a closed flask in a boiling-water bath for thirty minutes, but the lower temperature is to be preferred, as the solution becomes less darkly coloured. As applied to the estimation of sucrose in wine, condensed milk, etc., the details of the process are as follows: A definite quantity of the sample is neutralised, clarified by the addition of lead acetate, filtered, and the excess of lead removed from the filtrate by means of sodium phosphate. After removing the lead phosphate by filtration, an aliquot portion of the filtrate is treated with a sufficient quantity of sodium hydroxide solution to render the alkalinity of the solution equivalent to $N/10$, and the mixture is then heated as described. After cooling, the solution is examined in the polariscope; any rotation observed is due solely to sucrose, and the quantity of the latter in the sample is then calculated. The results obtained by the process agree closely with those yielded by the ordinary polarimetric method of estimating sucrose.

W. P. S.

A Modification of the Furfuraldehyde Method of Estimating Pentosans. K. H. BÖDDENER and BERNHARD TOLLENS (*J. Landw.*, 1910, 58, 232—237).—It is usual to estimate pentosans by distilling with hydrochloric acid, collecting the furfuraldehyde formed, and then converting this into a weighable substance by precipitating with phloroglucinol in the cold, leaving the mixture for sixteen to twenty hours. The authors find that precipitation is practically complete in a much shorter time if the mixture is heated to 80 — 85° , and then allowed to cool for one and a-half to two hours; bluish-green flocks are thus formed, which are readily filtered and washed. The phloroglucide is not the same as is obtained in the cold, the reaction being $C_5H_4O_2 + C_6H_5O_2 = C_{11}H_{10}O_3 + 3H_2O$, whilst in the cold the products are $C_{11}H_6O_3 + 2H_2O$. The necessary tables are given for the conversion.

The modification is not suitable if it is desired to estimate the methylpentosans separately; further (this vol., ii, 63), it does not give identical results with the older method, but the differences are only small. Its great value is the considerable saving of time it effects. E. J. R.

Estimation of Starch. FRIEDRICH SCHUBERT (*Chem. Zentr.*, 1910, ii, 688—689; from *Osterr.-ung. Zeitsch. Zucker-Ind. Landw.*, 1910, 39, 411—422).—The author discusses the more important processes which have been proposed for the estimation of starch, and describes the following modification of Lintner's process for the estimation of starch in barley (Abstr., 1907, ii, 823): A weighed

quantity of the barley is rubbed down with 25 c.c. of a 1% phosphotungstic acid solution, 75 c.c. of hydrochloric acid are then added, and, after the lapse of thirty minutes, the solution is poured through a filter. As exactly 100 c.c. of reagents have been added to the barley, there is no need to dilute the mixture to any definite volume, but the optical rotation of the filtrate must be corrected for the quantity of water present in the barley and for the volume of the dissolved starch. One gram of pure starch occupies a volume of 0.49 c.c.

W. P. S.

Estimation of Acetaldehyde by means of Pyrrole and Application of this Method to the Estimation of Lactic Acid. W. SOBOLEWA and J. ZALEWSKI (*Zeitsch. physiol. Chem.*, 1910, 69, 441—451).—Into a number of test-tubes is placed the reagent, consisting of 5 c.c. of aqueous pyrrole and 10 c.c. of 2.2% hydrochloric acid. Into each of the tubes is introduced an increasing volume of acetaldehyde solution of known strength (about 0.25 gram per litre), and after half an hour the minimum quantity of acetaldehyde required to produce an opalescence is ascertained. This then serves as a measure for the estimation of the concentration of acetaldehyde solutions.

On boiling a lactate with dilute sulphuric acid in a current of air and cautiously adding potassium permanganate, 80—92% of the lactic acid is obtained as acetaldehyde, which may then be estimated by the pyrrole method.

L. DE K.

Titanium Chloride in Volumetric Analysis. IV. Estimation of Quinones. EDMUND KNECHT and EVA HIBBERT (*Ber.*, 1910, 43, 3455—3457).—Quinones are reduced by titanium chloride in the cold. To the solution of the quinone in cold water is added an excess of the titanium trichloride, and the excess of the latter determined by titration with iron alum, using potassium thiocyanate as indicator. The titration of the quinone may also be carried out directly with the titanium chloride, using methylene-blue as an indicator; the quinone is quantitatively reduced before the methylene-blue enters into reaction and is decolorised.

Analytical results are given with *p*-benzoquinone, toluquinone, and β -naphthaquinone.

In a footnote it is pointed out that methylene-blue may be used as an indicator instead of potassium thiocyanate in the titration of ferric salts.

T. S. P.

Acids in Tan Liquors. HENRY R. PROCTER and A. SEYMOUR-JONES (*J. Soc. Chem. Ind.*, 1910, 29, 1354—1362).—The estimation of the acids present in tan liquors is of technical importance, since these substances act on hide in such a way as to facilitate the absorption of tannin. Such action is confined to the relatively strong acids, and is not exhibited by weak acids, such as the phenols, and for that reason the method of estimation must discriminate between the two classes. Many methods have been devised for this purpose, and in the present investigation the best known of them have been examined, and the results obtained are discussed and criticised.

Among the methods available, the discrimination referred to above is effected in one of two ways, (a) the tannins and other weak acids are removed by precipitation with gelatin, hide powder, or some similar agent, and the acids in the filtrate estimated by titration with standard alkali, using a suitable indicator, or (b) liquors are titrated directly with standard alkali in presence of an indicator, which will react with the stronger acids only. A special case of class (a) is the "lime-water" method, which depends on the fact that lime forms soluble salts with the stronger acids, and insoluble salts with the tannins, phenolic matters, etc., the formation of a definite faint turbidity being taken as the end-point. The general objections to methods of class (a) are (1) co-precipitation of stronger acids, and (2) undue dilution of the liquors. Methods of class (b) present as chief difficulty the selection of a suitable indicator. The authors think that the best results are obtainable with methods of group (b), and they are now engaged in the investigation of suitable indicators. The most promising results were obtained with Congo-red (10^{-4}), methyl-orange (10^{-4}), haematein (10^{-1} to 10^{-15}), and fluorescein (10^{-5} to 10^{-7}). The figures given in brackets after the name of each indicator represent the concentration of hydrogen ions at which colour change occurs.

T. A. H.

Separation of Saturated Fatty Acids (Palmitic and Stearic) from Oleic Acid. PIETRO FALCIOLA (*Gazzetta*, 1910, 40, ii, 217--229).—See this vol., i, 5.

Estimation of Total Tartaric Acid by the Goldenberg Process. CHARLES ORDONNEAU (*Bull. Soc. chim.*, 1910, [iv], 7, 1034--1041).—In order to ascertain the effects on the analytical results obtained by the Goldenberg method for the examination of factory and commercial tartaric products of impurities likely to occur in such materials, the author has applied the 1907 modification of that process (*Abstr.*, 1908, ii, 237) to potassium hydrogen tartrate containing known amounts of various impurities.

With calcium tartrate alone the results are 3·53% too low when phenolphthalein is used as indicator, and 3·60% for litmus, whilst with potassium hydrogen tartrate containing 5 and 10% of calcium tartrate, the corresponding losses are 2·24 and 2·39% for litmus and 1·25 and 1·34% respectively for phenolphthalein, but these losses are somewhat reduced by the presence of alumina, although the loss due to the presence of 5% of the latter alone is 19·35% for litmus and 8·80% for phenolphthalein. Similar errors are caused by ferrous, ferric, and aluminium phosphates. The errors caused by these and other substances are tabulated in the original. In general, the losses are about twice as great for litmus as for phenolphthalein, and an approximation to the correct figure may be got as a rule by adding to the result obtained with phenolphthalein the difference between this result and that furnished by the use of litmus as an indicator, although a further correction is needed in some cases. Phenolphthalein may be used in all cases in place of litmus if the titration is carried out at 50°, after boiling and cooling the liquid. Certain of the changes suggested

by the author have been made in the most recent form of the Goldenberg process, adopted by the London Congress of Applied Chemistry (Abstr., 1910, ii, 758).

T. A. H.

Detection of Hydrocyanic Acid in an Exhumed Corpse and the Stability of Hydrocyanic Acid in Presence of Putrefying Matter. WILHELM AUTENRIETH (*Ber. pharm. Ges.*, 1910, 20, 432—446).—It is generally assumed that hydrocyanic acid disappears rapidly in animal organisms by (1) combination with dextrose in the blood; (2) interaction with proteins; (3) hydrolysis to formic acid, or (4), according to Ganassini (Abstr., 1904, ii, 758), conversion into xanthine derivatives. The detection of the acid in a child's corpse which had been exhumed after forty-three days lead the author to investigate the stability of hydrocyanic acid in presence of decomposing matter of various kinds, when it was found that, although the acid disappears, it does so comparatively slowly.

In a mixture of pig's stomach, intestine, and pancreas (50 grams) with bitter almond water (50 grams) and water (200 c.c.), hydrocyanic acid could still be detected by the Prussian blue, guaiacum, or thiocyanate tests after forty-five days, and this was also the case when dilute potassium cyanide solution was substituted for bitter almond water. When the quantity of acid initially present was reduced to 1 in 15,000 it could still be detected after thirty-six days. One part of the acid in 10,000 of cow's blood could still be detected by the Prussian blue reaction after forty-eight days.

In a series of quantitative experiments, an aliquot part of the mixture was distilled after twenty and also after sixty days, and the acid estimated by Liebig's method. The percentages of the acid originally present, found after twenty days, varied from 47·7 to 87·5, and after sixty days from 41·4 to 63·3. No evidence of more rapid disappearance of the acid in presence of dextrose or proteins could be obtained, and in this respect the behaviour of the acid seems to be different in the dead and living organism, probably because active enzymes are present in the latter case.

T. A. H.

Influence of the Alkalinity of the Wash-Water on the Percentage of Water in Butter. W. MEYERINCK (*Chem. Weekbl.*, 1910, 7, 951—953).—Butter washed with acidified water appears to have a lower percentage of fat than that washed with alkaline water.

A. J. W.

Reactions of Cyclic Amines. F. LAVILLA LLORENS (*Anal. Fis. Quim.*, 1910, 8, 127—132).—The following bases give characteristic colorations when oxidising agents, such as potassium permanganate, potassium ferricyanide, potassium or ammonium persulphate, are added to their solutions in dilute acid. Potassium permanganate is the best reagent to use, a few drops of a 0·2% solution developing a coloration rapidly.

Aniline: greyish colour, initially, then more or less reddish-violet tinge, which changes to a characteristic blue; this, after a long time, takes on a greenish hue.

General and Physical Chemistry.

Recalculation of Atomic Refractions. FRITZ EISENLOHR (*Zeitsch. physikal. Chem.*, 1910, **75**, 585—607).—As certain factors, for example, optical exaltation, were not sufficiently taken into account in the older tables of atomic refractivities, the author has recalculated the refraction for the H_α , D , H_{β} , and H_γ lines, and the dispersions, $H_\beta - H_\alpha$ and $H_\gamma - H_\alpha$, for a large number of non-aromatic compounds, and from the results the atomic refractions and dispersions given in the accompanying table have been calculated. The experimental data is due mainly to Brühl and to Landolt, and has been amplified by the author. On the basis of the new data, benzene is found to show no optical anomaly.

Atomic Refractions.

	H_α	D	H_β	H_γ	$H_\beta - H_\alpha$	$H_\gamma - H_\alpha$
CH ₃ group	4·593	4·618	4·668	4·710	0·071	0·113
Carbon	2·413	2·418	2·438	2·466	0·025	0·056
Hydrogen	1·092	1·100	1·115	1·112	0·023	0·029
Oxygen (in CO group)	2·189	2·211	2·247	2·267	0·057	0·078
" (in ethers)	1·639	1·643	1·649	1·662	0·012	0·019
" (in OH group)	1·522	1·525	1·531	1·541	0·006	0·015
Chlorine	5·933	5·967	6·013	6·101	0·107	0·168
Bromine	8·803	8·865	8·999	9·152	0·211	0·340
Iodine	13·757	13·900	14·224	14·521	0·482	0·775
Ethylene Linking	1·636	1·733	1·824	1·893	0·133	0·200
Acetylene ,	2·328	2·398	2·506	2·538	0·139	0·171

G. S.

Refraction and Magnetic Double Refraction of Solutions of the Rare Earths. G. J. ELIAS (*Ber. Deut. physikal. Ges.*, 1910, **12**, 955—962. Compare Abstr., 1908, ii, 549).—The refractive index of an aqueous solution of neodymium nitrate has been measured for wavelengths in the neighbourhood of the yellow absorption band. The data indicate the occurrence of slightly anomalous dispersion in this region.

Preliminary observations of the double refraction produced by a solution of erbium nitrate in a transverse magnetic field are also recorded. The double refraction increases with the intensity of the magnetic field; it is greater for blue than for yellow light, and appears to be somewhat anomalous in the immediate neighbourhood of the absorption bands. No magnetic double refraction could be detected in solutions of neodymium nitrate, manganous nitrate, or ferric chloride.

The double refraction phenomena are examined theoretically.

H. M. D.

The Sequence of Chemical Forms in Stellar Spectra. SIR NORMAN LOCKYER (*Proc. Roy. Soc.*, 1910, **A**, **84**, 426—432).—A brief account is given of recent work on the classification of stars on the

basis of spectroscopic observations and the influence of temperature on the spectra of "chemical forms" characterised by special molecular or corpuscular groupings.

H. M. D.

The Emission and Absorption of Luminous Gases from Experiments with Continuous Currents of High Intensity.
WILHELM JUNGJOHANN (*Zeitsch. wiss. Photochem.*, 1910, 9, 84—103, 105—129, 141—168).—The intensity of the emission spectra obtained from nitrogen, hydrogen, carbon monoxide, and oxygen when subjected to continuous currents in Wehnelt tubes has been measured for currents of varying intensity. In the case of nitrogen and hydrogen the absorption was also investigated.

The data for nitrogen show that the intensity of the first group of bands is proportional to the current density between 1·4 and 12·7 amperes per square cm.; on the other hand, that of the second group of bands increases more rapidly than the current density or the energy consumption.

In the case of hydrogen, the variations of intensity of the spectrum do not appear to be related in any simple way with the current density or the energy consumption, and the lines of the first subsidiary series behave differently according to the pressure of the gas in the discharge tube.

The intensity of the red and green bands of carbon monoxide increases in a linear manner with the current density, that of the blue bands more rapidly. With increasing current intensity the energy maximum is displaced in the direction of smaller wave-lengths.

The conclusion drawn from these observations is that the changes in the energy of the radiation from a luminous gas cannot be accounted for in a simple manner by the changes in the intensity of the current, or by the variations in the energy consumption, or yet by the corresponding changes in temperature.

H. M. D.

The Resonance Spectra of Iodine. ROBERT W. WOOD (*Physikal. Zeitsch.*, 1910, 11, 1195—1196 *).—Resonance spectra, similar to those investigated previously in the case of sodium vapour, are obtained quite readily when a large evacuated bulb containing a small quantity of iodine is subjected to the influence of white or mono-chromatic light. When the fluorescence is excited by white light, its colour is yellowish-green, but a reddish-yellow fluorescence is obtained when the rays from a mercury lamp are used as the exciting agent. Spectroscopic examination of the fluorescent light of iodine acted on by the mercury rays has shown that the spectrum consists of a series of isolated lines separated from one another by intervals of about 65—70 Ångström units. The investigation of the resonance phenomena can be carried out much more easily in the case of iodine as compared with sodium, for the fluorescence effects are developed by iodine vapour at the ordinary temperature.

H. M. D.

The Glow Discharge in Rubidium and Cæsium Vapours.
GEORG GEHLHOFF (*Ber. Deut. physikal. Ges.*, 1910, 12, 963—960).—The phenomena accompanying electrical discharge through rubidium

* *and Phil. Mag.*, 1911, [vi], 21, 261—265.

and caesium vapour have been examined in a similar way to that described previously in the case of sodium and potassium (*Abstr.*, 1910, ii, 679). Discharge commences through rubidium vapour at about 120° , and through caesium at $60-70^\circ$. In both cases the negative glow is at first yellowish-green in colour, but at a higher temperature rubidium exhibits a bluish-violet, and caesium a sky-blue, colour. The nature of the emission spectra of the negative and positive glow, and the effect of the admission of small quantities of hydrogen, nitrogen, and air are described in detail (compare following abstract).

H. M. D.

The Emission of the Series and Fundamental Spectra in the Glow Discharge of the Alkali Metal Vapours. GEORG GEHLHOFF (*Ber. Deut. physikal. Ges.*, 1910, 12, 970—974).—The author compares the glow discharge emission spectra of sodium, potassium, rubidium and caesium. All four metals show the lines of the principal and subsidiary series in the spectrum of the anodic glow light, although it is probable that the principal lines in the spectra of potassium, rubidium, and caesium are due to the surrounding positive sheath. In the case of sodium, the spectrum of this positive column of light contains only the principal series of lines; in the case of the three other metals, both principal and subsidiary series are observed, although the secondary series is very faint for potassium. The negative glow spectrum of sodium shows the principal and subsidiary series, whereas the corresponding spectra for the three other metals exhibit the secondary series lines and the fundamental spectrum.

These relationships indicate a close relationship between the spectral emission and the atomic weight of the metal. It is assumed that the principal series lines are due to impacts between the atoms and electrons of small velocity, those of the subsidiary series to impacts with electrons of intermediate velocity, whilst the fundamental spectra are caused by impact of the atoms with high speed electrons. By taking into account the varying electropositive character of the alkali metals, it is shown that various phenomena observed in connexion with the glow discharge can be satisfactorily accounted for.

When the discharge tube contains both sodium and potassium vapours, the positive glow and sheath exhibit the potassium spectrum. The negative glow shows the principal and subsidiary series of sodium lines, and, in addition, the subsidiary series and the fundamental spectrum of potassium. This effect is explained in terms of the above assumption as due to the less electropositive character of the sodium.

H. M. D.

Absorption in Luminous Hydrogen. RUDOLF LADENBURG (*Ber. Deut. physikal. Ges.*, 1910, 12, 1018—1022).—Polemical against Pflüger (compare *Abstr.*, 1910, ii, 811).

H. M. D.

The Ultra-violet Absorption of Benzene. L. GREBE (*Zeitsch. wiss. Photochem.*, 1910, 9, 130—140).—The absorption of ultra-violet rays by benzene in liquid and vapour form has been investigated. The spark discharge between aluminium electrodes under water was

used as a source of ultra-violet radiation, and absorption spectra were obtained by means of a quartz spectrograph. In the case of benzene vapour, observations were made at temperatures ranging from 17° to 185°, and the records show that this variation of temperature is practically without influence on the position of the absorption bands. The same result follows from the observations on liquid benzene at 20°, 43°, and 70°. On comparing the positions of the liquid and vapour bands, it is found that the former are displaced in the direction of the visible spectrum by a nearly constant amount, represented by 17 Ångström units.

From experiments in ethyl-alcoholic solutions containing 0·1 and 50% of benzene respectively, it is found that with diminishing concentration the bands are displaced in the direction of smaller wave-lengths. In a 50% solution in ethyl ether, the bands occupy the same position as in the corresponding alcoholic solution. H. M. D.

Molecular Vibrations of Solid Substances. A. STEIN (*Physikal. Zeitsch.*, 1910, 11, 1209—1212).—On the assumption that the molecules of solid substances are in vibratory movement and that the amplitudes of the vibrations are proportional to the distance between the centres of the molecules in the case of substances which have the same melting point, the author deduces an expression for the relative frequencies of the molecular vibrations. This may be written in the form $n_1/n_2 = \sqrt{m_2} \sqrt[3]{v_2} / \sqrt{m_1} \sqrt[3]{v_1}$, in which m , n , and v denote respectively the frequency, the molecular weight, and the molecular volume of a solid substance.

According to the theory that the absorption of ultra-red rays is a consequence of molecular (or atomic) vibrations, the values of n_1/n_2 can be obtained from observations on the behaviour of solid substances towards ultra-red rays. From the mean frequencies of vibration of the residual rays obtained by Rubens by selective reflexion from plates of rock-salt, sylvine, potassium bromide, and potassium iodide, the values of n_1/n_2 are obtained for the different pairs. On comparison of these ratios with the corresponding $\sqrt{m_2} \sqrt[3]{v_2} / \sqrt{m_1} \sqrt[3]{v_1}$ ratios, it is found that the two series of numbers are approximately the same. A similar agreement is found by a comparison of the data for quartz and fluorspar.

The values of $\sqrt{m} \sqrt[3]{v}$ are also tabulated for various series of metals having approximately the same melting points. These values indicate the existence of simple relationships, for the relative magnitudes correspond very closely with simple integral ratios. H. M. D.

Influence of Substituent Groups on the Spectrum of Progressive Phosphorescence. JOSEPH DE KOWALSKI and J. DE DZIERZICKI (*Compt. rend.*, 1911, 152, 83—85. Compare this vol. ii, 3).—The progressive phosphorescence of the following substances has been examined at about —190° in alcoholic solution: benzoic acid, the tolue acids, the amino- and hydroxy-benzoic acids, benzonitrile, and the three toluronitriles. The wave-lengths of the principal bands are given. The substituent groups are found to have a marked influence on the spectrum of progressive phosphorescence; those, like

the CO_2H and CN groups, which extend it towards the red are termed "bathophosphic," whilst those which prolong the spectrum towards the violet are called hypophosphic. Examples of the latter are the hydroxy- and methoxy-groups; the methyl group occupies an intermediate position between these.

W. O. W.

Ultra-microscopic Observations. J. AMANN (*Zeitsch. Chem. Ind. Kolloide*, 1911, 8, 11—15. Compare Abstr., 1910, ii, 844).—If strongly illuminated ultra-microscopic particles are examined by means of an ultra-microscope which is slightly out of focus, the image of a particle presents the appearance of a series of concentric light and dark rings showing interference colours. With this arrangement the sparkling of the ultra-microscopic particles is much more evident than when the ultra-microscope is in focus. The sparkling effect is attributed to a variation in the amount of light reflected from a particle at different times in consequence of the irregular shape of the particle and its rotational motion. These movements are termed krypto-kinetic, in order to distinguish them from Brownian motion. The phenomenon in question has also been observed in sections of quartz from different sources.

Solutions of potassium ferro- and ferri-cyanide under the ultra-microscope exhibit numerous large particles. When subjected to white light, a large number of small particles suddenly appear, and this so-called photo-phase is supposed to be the immediate cause of the evolution of oxygen from hydrogen peroxide when a solution of this substance is brought into contact with a previously isolated ferro- or ferri-cyanide solution (compare Weigert, Abstr., 1908, ii, 5).

Observations of the colour of fluorescein under different conditions are recorded. According to these it appears that a colloidal substance may exhibit four totally different colours according to the method of illumination.

H. M. D.

Micro-polarisation. EMIL FISCHER (*Ber.*, 1911, 44, 129—132. Compare *Donau*, Abstr., 1908, ii, 647).—The following pieces of apparatus are described: 1. A small glass cylinder, 20×7 mm., provided with a glass stopper. This is used for the preparation of small amounts of solutions of known concentration. 2. A pyknometer of the usual form, but with very thick walls, so that it holds about 107 c.c. of liquid. 3. Observation tubes for the polarimeter. These are of white glass, 50×1.5 mm., and do not hold more than 1 c.c. 4. A narrow glass tube drawn out to a capillary for transferring the liquids from one vessel to another. The light must be strong; either incandescent gas light or the apparatus made by Schmidt and Haensch for obtaining homogeneous light from the Nernst lamp is recommended.

An accurate balance is essential, and very volatile solvents are to be avoided. With tubes narrower than those described, the sedimentation of the solutions does not take place.

J. J. S.

Action of Ultraviolet Rays in Accelerating Chemical Reactions and in Modifying a State of False Equilibrium. JEAN POUGET (*J. Pharm. Chem.*, 1910, [vii], 11, 540—543).—Ultra-

violet light accelerates the rate of change of plastic into rhombic sulphur, of vitreous selenium into crystalline selenium, and of barley sugar into the crystalline form. It also increases the velocity (1) of the transformation of potassium manganate into potassium permanganate; (2) of the reaction between potassium permanganate and oxalic acid; (3) of the inversion of sucrose by acids, and (4) of the saponification of ethyl acetate by sodium hydroxide.

T. S. P.

Principal Types of Photolysis of Organic Compounds by Ultra-violet Light. DANIEL BERTHELOT and HENRY GACDECOS (*Compt. rend.*, 1910, 151, 1349—1352). Compare *Abstr.*, 1910, i, 349, 814).—Hydrogen predominates in the gases formed when alcohols of the type $\text{CH}_2\text{R}-\text{OH}$ undergo decomposition through exposure to ultra-violet light; the hydrocarbon R_2 is evolved with the lower terms of the series, with the higher members it remains dissolved in the alcohol. Hydrocarbons of the type R_2 or RR' are not formed in the case of alcohols with a branched chain, but, owing to the greater ease with which the lateral chain is broken, methane and ethane occur in considerable quantity. Photolysis occurs more readily with the lower members of the alcohols, aldehydes, and acids than with the higher ones. Hydrogen (2 vols.) and carbon monoxide (1 vol.) are evolved from allyl alcohol.

Carbon monoxide is the principal gaseous product when aldehydes are decomposed, the proportion rising as the series is ascended; hydrocarbons are also formed. Acraldehyde undergoes rapid polymerisation under the action of the light; the gas evolved contains carbon monoxide (80 vols.), carbon dioxide (5 vols.), hydrogen (5 vols.), and an unsaturated hydrocarbon (10 vols.). Citral gives carbon monoxide and hydrogen. Camphor forms carbon monoxide (5 vols.) and methane (1 vol.).

Acids give chiefly carbon dioxide, accompanied by hydrogen and carbon monoxide, with hydrocarbons in the earlier members of the series, the latter diminishing as the series is ascended. W. O. W.

Action of Light on Chlorophyll. P. A. DANGEARD (*Compt. rend.*, 1910, 151, 1386—1388).—A simple method of demonstrating the effect of light of different wave-lengths on chlorophyll or other substances is to mix an alcoholic solution of chlorophyll with collodion and coat a glass plate with the mixture. When dry, the plate is exposed to a good spectrum. After some hours, colourless bands appear where action has taken place; the first band to appear corresponds with the principal absorption band of chlorophyll. W. O. W.

Canal Rays. JOHANN KOENIGSBERGER and K. KILCHLING (*Ber. Deut. physikal. Ges.*, 1910, 12, 995—1017).—Observations relating to the nature and properties of canal rays are described with reference to the phenomena of dissociation, neutralisation, diminution in velocity, and deflexion. H. M. D.

The Rate of Development of Heat by Pitchblende. HORACE H. POOLE (*Phil. Mag.*, 1911, [vi], 21, 58—62. Compare *Abstr.*, 1910,

ii, 176).—New determinations of the rate of heat development from pitchblende, by the former method, gave as the results 8·15, 6·5, and 6·2 ($\times 10^{-5}$ cal. per hour per gram), the last experiment, which was the best, agreeing well with the former determination, 6·1. On the assumption that 1 gram of radium generates 110 cal. per hour, the theoretical development should be 4·4.

F. S.

The Ratios which the Amounts of Substances in Radioactive Equilibrium Bear to One Another. HUGH MITCHELL (*Phil. Mag.*, 1911, [vi], 21, 40–42).—From the general solution of the equation giving the quantity of the n th substance in a disintegration series after any time t , the parent substance being initially free from products, the correct relation between the quantities of the members of a radioactive series in equilibrium is deduced. The ratio of the number of atoms of the n th substance to that of it and all the preceding substances in equilibrium with it, is the same as the ratio of the average life of the n th substance to that of the parent substance. The correct relation is thus: $\lambda_1/\lambda_n = x_n/(x_1 + x_2 + x_3 + \dots + x_n)$, instead of $\lambda_1/\lambda_n = x_n/x_1$, as usually written. The correct relation makes no assumption as to the relative periods of the parent and its products beyond the requirement that the parent element should be the longest-lived of the series.

F. S.

The Relation between Viscosity and Atomic Weight for the Inert Gases; with its Application to the Case of the Radium Emanation. ALEXANDER O. RANKINE (*Phil. Mag.*, 1911, [vi], 21, 45–53).—From the temperature-coefficient of the viscosity of the inert gases, Sutherland's constant C is calculated, and from it the viscosities at the critical temperatures are deduced, and found to be proportional to the square-root of the atomic weights for argon, krypton, and xenon. The value so found for helium is about sixteen times the value so calculated from its atomic weight, but direct experiments by Schmitt on the viscosities of argon and helium from -193° to $+184^\circ$ have shown that, whereas argon conforms to, helium departs from Sutherland's equation the more seriously the lower the temperature. It is probable the equation fails so near to the absolute zero. The unknown critical temperature of neon, calculated from the assumption that its viscosity at the critical temperature is proportional to the atomic weight and from Sutherland's equation, is $61\cdot1^\circ A$. Calculated from the relation that Sutherland's constant is proportional to the critical temperature, it is $62\cdot7^\circ A$.

The viscosity of radium emanation at 0° , calculated from its atomic weight, critical temperature, and the value of Sutherland's constant, which is taken as proportional to the latter, is $2\cdot13 \times 10^{-4}$. The molecular volume calculated from this is 16·97 times that of helium, and larger than that of any other gas in the group. The deduction that he critical temperature, and therefore Sutherland's constant, is proportional to the fourth power of the true atomic radius, is found to hold good strictly for all the gases except helium, for which a departure is to be expected.

F. S.

Researches on Helium. IV. Absorption of Helium by Salts and Minerals. ARNALDO PIUTTI (*Rend. Accad. Sci. Fis. Mat. Napoli*, 1910, [iii], 16, 253—255*).—The author finds that helium is absorbed by certain fused salts and minerals, and points out the bearing which this has on the calculations of the age of rocks, which have been made on the assumption that the helium contained in them has all been derived from radioactive elements.

Crystals of potassium sulphate deposited in the course of a month from an aqueous solution in an atmosphere of pure helium did not absorb the gas. On the other hand, antimonite, borax, and boric anhydride, after fusion in an atmosphere of helium, show the spectrum of the gas when they have been powdered in the air. If air is passed through fused borax or boric anhydride, and the fused mass then suddenly cooled by means of liquid air, the solid obtained shows the spectrum of helium. No helium can be found when air has not been passed through the fused salt.

R. V. S.

The γ -Rays of Thorium and Actinium. ALEXANDER S. RUSSELL and FREDERICK SODDY (*Phil. Mag.*, 1910, [vi], 21, 130—154. Compare Abstr., 1909, ii, 460, 851; 1910, ii, 474).—The two types of thorium γ -rays, from mesothorium-2 and thorium-D, resemble that of radium-C, both in the ratio of the intensity of the γ - to that of the β -rays and in their penetrating power. Thorium-D gives the most penetrating γ -rays known, the absorption-coefficient λ being from 8 to 21% less than for radium-C γ -rays, whereas for the mesothorium γ -rays, λ is from 4 to 25% greater than for radium, according to the experimental disposition used for the measurements. The γ/β ratio for mesothorium is from 1·0 to 0·8, and for thorium-D 0·69 to 0·51, times that for radium-C. The proportion of γ -rays contributed by the two thorium products in equilibrium in minerals is very similar. The γ/β ratio of actinium is only from one-eighth to one-sixteenth of that of radium-C, so that actinium in this respect resembles uranium-X. The γ -rays of actinium are abnormally highly absorbed by lead, the absorption curve showing two sudden changes in the value of λ at 0·3 cm. and 0·85 cm., whereas for zinc and aluminium the curves are exponential, λ being about 1·9 times that for radium-C. For lead the ratio ranges from about 8 times to about 2·2 times, according to the part of the range examined and the disposition employed.

Admixture of mesothorium with radium can be detected by the departure of the γ -ray absorption curve in lead from the exponential form, the γ -rays of mesothorium being distinctly the less penetrating. Some generalisations with regard to γ -rays show that they are more allied in properties to the α -rays which precede and follow them in the series than to the β -rays which accompany them. The penetrabilities of the γ -rays from uranium-X, mesothorium-2, radium-C, and thorium-D increase as the period of the product diminishes, as for α -rays in general, whilst the α -rays preceding and following these types of γ -rays show the same increase in penetrating power as the γ -rays themselves. The greater the penetrating power of the γ -rays, the less abnormal the absorption by lead as compared with other metals, and the less is the hardening produced by passage through lead.

F. S.

The Ionisation of the Atmosphere Due to Radioactive Matter. A. S. Eve (*Phil. Mag.*, 1911, [vi], 21, 26–40).—The radioactive theory of the ionisation of the atmosphere is generally satisfactory, but some results remain unexplained. Assuming the presence of the emanation in equilibrium with 80×10^{-12} gram of radium per cubic metre of the atmosphere on the average, the ionisation so caused by the α -rays is 1·63 ions (per c.c. per second), while thorium, possibly, contributes not more than one additional.

From Wright's values of the natural ionisation in an aluminium electroscope at Toronto, on land and on the frozen surface of Lake Ontario, the ionisation contributed by the γ -rays from the radium in the earth is estimated to be in the free air about 2·5, which is smaller than that found in many experiments with lead-screened electroscopes, and suggests that part of the penetrating radiation comes from the atmosphere. It is calculated, however, that the penetrating rays of the atmosphere from the emanation and its products must produce an ionisation negligible in comparison with that due to the α -rays, and are one twenty-third as intense as the penetrating rays from the earth. The total ionisation of the air from all sources, assuming the penetrating rays of the radium and thorium series in the earth to be equal, and neglecting those from uranium and actinium, is 4·35, which is somewhat greater than the value normally found in clear weather.

The fact that the ionisation over the ocean is scarcely less than over the land is the greatest objection to the radioactive theory of atmospheric ionisation, for the amount of radium in sea-water is extremely small. It is calculated that there should be a rapid diminution of the effect due to γ -rays from the earth with altitude, detectable at an elevation of 100 metres, while at 1000 metres the effect should be negligible. In an appendix, Wulf's results (*Physikal. Zeitsch.*, 1910, 11, 811) on the Eiffel tower are referred to as establishing this rapid diminution.

F. S.

The Radioactivity of the Leinster Granite. ARNOLD L. FLETCHER (*Phil. Mag.*, 1911, [vi], 20, 102–111).—The whole mass of the Leinster granite, covering 600 square miles, contains radium, the mean content being $1\cdot7(\times 10^{-12}$ gram per gram). Separate specimens showed quantities varying from 0·41 to 4·36, the specimens showing the highest and lowest amount coming from the same locality. Probably the distribution is fairly homogeneous throughout. The mica in the granite, constituting about 20% of the whole, contained about half the radium, but the small quantity of thorium present did not seem to be concentrated in any constituent. One crystal of biotite, showing countless pleochroic halos and considerable radioactive darkening, contained 11·87 units of radium, but no thorium, and in the three specimens of granite containing the most radium there was no thorium. In ten out of twenty-three specimens, the ratio between the radium and thorium was between 2·0 and $2\cdot6 \times 10^{-7}$, the mean ratio for the whole series being $2\cdot4 \times 10^{-7}$. Details are given of the methods employed, including the latest form assumed by Joly's arrangement for estimating thorium in minerals.

F. S.

A Spectroscopic Investigation of the Nature of the Carriers of Positive Electricity from Heated Aluminium Phosphate. FRANK HORTON (*Proc. Roy. Soc.*, 1910, 4, 84, 433—449).—The value found for e/m for the positive ions from heated aluminium phosphate indicates a molecular weight of the carrier of about 28, and the possibility that the molecules are either nitrogen or carbon monoxide. Two hours' heating of a platinum strip coated with aluminium phosphate generated sufficient ions to allow of a spectroscopic examination of their nature. The spectrum was found to be the same whether the strip was heated simply, or in an electric field under conditions such that the ions would be formed, and in the electrodeless ring discharge showed the lines of carbon and oxygen together with others due to mercury and hydrogen, whilst in an electrodeless spectrum tube the banded spectrum of carbon monoxide was obtained. The conclusion is arrived at that the positive ions are molecules of carbon monoxide.

F. S.

Relationship between Chemical Affinity and the Photo-electric Effects of Potassium in its Compounds. ROBERT POHL and P. PRINGSHEIM (*Ber. Deut. physikal. Ges.*, 1910, 12, 1039—1048. Compare Abstr., 1910, ii, 922).—The photo-electric properties of potassium alloys have been investigated, and it is shown that these are connected with the electro-chemical properties of the metal with which the potassium is associated. A comparison of the results obtained for bismuth, antimony, and phosphorus alloys shows that the normal photo-electric effect of potassium is displaced in the direction of smaller wave-lengths as the metal in combination with the potassium becomes more electro-negative. The same behaviour is exhibited by the alloys of the series bismuth, lead, thallium, mercury, and gold. In those cases in which a selective photo-electric effect can be observed, this is also found to be displaced in the same direction as the electro-negative character of the second component of the alloy becomes more pronounced. At the same time the range of wave-lengths which give rise to photo-electric activity becomes more restricted.

Since the frequency of the active rays affords a measure of the velocity with which the electrons leave the molecule of the photo-electrically active substance, it appears that the affinity between a metal and its electrons can be determined from observations on the wave-lengths of the rays which give rise to the photo-electric effect.

H. M. D.

Transference Experiments with Thallous Sulphate and Lead Nitrate. K. GEORGE FALK (*J. Amer. Chem. Soc.*, 1910, 32, 1555—1571).—A study of the change of the transference number of tri-ionic salts with the concentration was carried out by Noyes (Abstr., 1901, ii, 143) with the object of ascertaining whether intermediate ions, such as KSO_4^+ in the case of potassium sulphate and NO_3Ba^+ in that of barium nitrate, exist in appreciable quantities in solutions of such salts, and the results were recorded for potassium sulphate, barium chloride, and barium nitrate.

Transference experiments have now been made with 0·03*N* and 0·1*N* solutions of thallous sulphate and lead nitrate at 25° with the aid of special apparatus. The cation transference numbers found for the thallous salt are 0·479 at 0·03*N* and 0·476 at 0·1*N*, and those for the lead salt 0·487 at both concentrations. The limit of error in these results does not exceed $\pm 0\cdot003$. The transference numbers at zero concentration, as calculated from Kohlrausch's extrapolated values of the equivalent conductivities of the separate ions, are 0·489 for thallous sulphate and 0·503 for lead nitrate, and are thus 2·5–3·2% higher than the values obtained by direct measurement at a concentration of 0·03–0·1*N*. It is not certain whether this change of the transference number with the concentration is real. If so, it might be due, in the case of thallous sulphate, to the presence of the intermediate ion $TiSO_4^+$. In the case of lead nitrate, however, the presence of the intermediate ion NO_3Pb^+ would probably cause a change in the opposite direction.

The results of these experiments and those of Noyes (*loc. cit.*) on the transference values of tri-ionic salts indicate that either the intermediate ion is not formed to any considerable extent by the dissociation of such salts up to concentrations of 0·1 or 0·2*N*, or that, if it is formed, its equivalent conductivity has a definite value of such magnitude as to render the transference number independent of its concentration.

E. G.

Method for Making Two Substances React in the Electric Arc. PAUL SABATIER (*Compt. rend.*, 1910, 151, 1328).—An apparatus similar to that described by Salmon (this vol., ii, 15) was employed by the author in 1899 (*Congrès Assoc. française*, I, 229). W. O. W.

A New Property of the Magnetic Molecule. PIERRE WEISS (*Compt. rend.*, 1911, 152, 79–81).—The magnetic susceptibility of magnetite has been measured at different temperatures between 550° and 900°, and the results plotted in the form of a curve. The conclusion is drawn that at certain temperatures the magnetic moment of the molecule increases by a definite aliquot portion of the magnetic moment at low temperatures, and the supposition is advanced that this is due to a variation in the size of the molecule or in the distance between the poles.

W. O. W.

Use of the Magnetic Field as a means of Determining Constitution in Organic Chemistry. V. PAUL PASCAL (*Bull. Soc. chim.*, 1911, [iv], 9, 6–12. Compare Abstr., 1910, ii, 100, 179).—Further evidence of the additive character of magnetic susceptibility in organic compounds is given (compare Abstr., 1910, ii, 580), and the values of *B* (the correction, which peculiarities of structure necessitate in calculating molecular susceptibility) are given for a number of compounds free from oxygen and chlorine. The atomic susceptibilities for the usual constituents of organic compounds are as follows: H = $-30\cdot5 \times 10^{-7}$; C = $-62\cdot5 \times 10^{-7}$; F = $-63\cdot0 \times 10^{-7}$; Cl = $-209\cdot5 \times 10^{-7}$; Br = $-319\cdot2 \times 10^{-7}$; I = $-465\cdot0 \times 10^{-7}$. Those for nitrogen, sulphur, and variously linked oxygen have been given

already (Abstr., 1910, ii, 100). For saturated open chain hydrocarbons, the value of B is nil , and the molecular susceptibility is given by the formula $S_x = -10^{-7}[n62.5 + (2n+2)30.5]$. For a single open chain ethylenic linking, $B = +57 \times 10^{-7}$, and for two or more such linkings, $+110 \times 10^{-7}$. For a double linking between two nitrogen atoms, $B = +19 \times 10^{-7}$, for one between a carbon and a nitrogen atom it becomes $+85 \times 10^{-7}$, and for two such linkings it is $+106 \times 10^{-7}$ but for a triple linking, as in CN, it falls to $+8 \times 10^{-7}$. The influence of the cyclopropane nucleus is $B = +75 \times 10^{-7}$, which is much greater than that, $+31 \times 10^{-7}$, due to the cyclohexane nucleus. Similarly, for the piperidine nucleus, $B = +37 \times 10^{-7}$. In cyclohexene derivatives, $B = +72 \times 10^{-7}$, and in cyclohexadiene compounds it is $+110 \times 10^{-7}$. These cases illustrate the general rule that the diamagnetism of the molecule in closed chain compounds falls with increase in the number of certain kinds of double linkings present.

T. A. H.

Solutions. III. and IV. F. SCHWERS (*Zeitsch. physikal. Chem.*, 1910, 75, 615—620, 621—627; *Bull. Soc. chim.*, 1910, [iv], 7, 1072—1077, 1077—1083.* Compare Abstr., 1910, ii, 1039).

III.—Relationship between the Density and the Magnetic Rotation of the Plane of Polarisation of Binary Mixtures.—It is shown from the data of Sir W. H. Perkin, that the ratio between the alterations of the density (difference between observed density and that calculated according to the mixture rule) and the alterations of the magnetic rotation (difference between observed and calculated rotation) is a constant for mixtures of the two components in any proportion. The constant, Z , has a definite value for each system, and when solutions of the same substance (water) in the different members of an organic series are examined, Z is found to increase with increasing molecular volume.

It is shown by reference to mixtures of sulphuric acid and water, and of nitric acid and water, that when electrolytic dissociation occurs, Z diminishes steadily with increasing dilution.

IV.—Density, Refractivity, and Magnetic Rotation of Dissociating Mixtures.—As in the case of sulphuric and nitric acids, the constants Z for hydrochloric, hydrobromic, and hydriodic acids in aqueous solution also diminish on dilution. When the molecular volume is increased by substitution of iodine or bromine for chlorine, the rotation constant diminishes and the refraction constant (calculated in a similar way) increases. When, however, the increase of molecular volume is due to an increase in the number of atoms in the molecule, the effect on the constants is the converse of that mentioned above. Electrolytic dissociation brings about an increase of the magnetic rotation of the plane of polarisation, and a diminution of the refractivity with reference to the density, if the latter is regarded as constant.

G. S.

The Isolation of Long-waved Heat Rays by Quartz Lenses. HEINRICH RUBENS and ROBERT W. WOOD (*Sitzungsber. K. Akad. Wiss. Berlin*, 1910, 1122—1137).—A method is described by means of which heat rays of wave-lengths ranging from 80μ to 200μ

* and *Bull. Acad. roy. Belg.*, 1910, 850—883.

can be isolated from the rays emitted by an incandescent mantle. The rays from the mantle are passed through two quartz lenses which are suitably placed with reference to the source of light, and the isolation of the long-waved rays is essentially dependent on the selective refraction of the quartz lenses. The bundle of rays obtained by this method is far from homogeneous, but the energy content is much greater than that of the homogeneous rays obtained by selective reflexion. By means of a radio-micrometer, the distribution of energy amongst the component rays of the bundle has been examined, and these measurements show a maximum intensity in the neighbourhood of $\lambda = 100\mu$.

Observations are also recorded which show the extent to which the long-waved rays are absorbed by various solid, liquid, and gaseous substances, and a comparison is made between the amounts of these rays and of those obtained by selective reflexion from potassium bromide ($\lambda = 82\mu$), which are reflected by various substances. In the case of rock-salt, fluorspar, and glass, the proportion of the reflected quartz rays is in good agreement with that calculated from the dielectric constants of those substances.

H. M. D.

A Simple Automatic Stirrer for Use with the Depressimeter. LOEDWYK TH. REICHER (*Chem. Weekblad*, 1910, 7, 1085—1087).—The author has devised an automatic stirrer for use with the depressimeter. A copper disk supported by a horizontal axle held by a clamp is connected with a jointed iron rod by means of an eccentric attachment. A horizontal arm connects the rod with the vertical stirrer. The bearing of the rod can be moved nearer to, or further from, the centre of the disk, thus diminishing or increasing its eccentricity. The motive power is supplied by a hot air engine through a belt to the copper disk.

A. J. W.

Vapour Pressures of Binary Mixtures in the Light of van der Waals' Theory. II. PHILIPP KOHNSTAMM (*Zeitsch. physikal. Chem.*, 1910, 75, 527—551). Compare Abstr., 1901, ii, 145).—Considerable light is thrown on the vapour-pressure curves of binary mixtures by a mathematical treatment based on the introduction by van der Waals of a new factor, the vapour pressure of an ideal binary mixture, the "mixture assumed as uniform," defined as follows. In the ordinary *p-v*-diagram for a single substance, the part of the isothermal joining the points on the diagram representing the gas and liquid phases is a straight line, but in the case of a binary mixture the corresponding part of the diagram will be a sloping and not a horizontal line (as evaporation does not occur at constant pressure). The "uniform mixture" is an ideal mixture, such that the line in question is horizontal, as for a simple substance. By making use of the (hypothetical) critical pressures and temperatures of such mixtures, a number of deductions as to the possible types of binary vapour-pressure curves are made. For the method used and the forms of the curves on different assumptions as to the relative magnitude of the factors concerned, the original paper should be consulted.

G. S.

Method for Determining the Molecular Weights of Dissolved Substances by Measurement of Lowering of Vapour Pressure. ALAN W. C. MENZIES (*J. Amer. Chem. Soc.*, 1910, 32, 1615—1624).—Apparatus is described for the determination of molecular weights in cases in which great accuracy is not required. It consists of an outer tube, in which the solvent is boiled, attached to a small, reflux condenser, and an inner test-tube provided with a pressure gauge-tube and a glass stopper. The side-tube from the outer tube to the condenser is of 1 cm. diameter, so that the solvent may boil under the barometric pressure, and is connected to the condenser by means of rubber tubing, furnished with a screw-clip. When the stopper is removed and the clip closed, the vapour of the liquid boiling in the outer tube escapes through the gauge-tube, which is open at both ends, into the test-tube. A narrow U-shaped side-tube connects the condenser with the lower part of the outer tube, and the condensed liquid is thus returned to the outer tube without cooling the upper part of the test-tube. Both the test-tube and gauge-tube are graduated. The lower end of the gauge-tube is in the form of a bulb, which is perforated by a number of holes to distribute the vapour as it issues. The boiling solvent in the outer tube maintains at a constant temperature the test-tube which contains the solution, the vapour pressure of which is being determined. The pressure is measured by the difference in the level of the liquids in the gauge-tube and test-tube.

The values of $K_{760} = p/p'$ (where p is the vapour pressure of the solvent, and p' that of the solution), that is, the lowering of vapour pressure in mm. of boiling solvent that would be caused by the presence of 1 gram-mol. of a non-volatile solute in 1 litre of solution, have been calculated for various solvents. The molecular weight can be calculated from the formula $M = 1000WKB/LV \times 760$, where W is the weight of solute added, L the measured lowering of the vapour pressure in mm., V the volume of the solution in c.c., and B the height of the barometer.

A series of determinations, carried out with this apparatus, are quoted, and the method is compared with ebullioscopic methods.

It is shown that, within the limits of error of observation, the vapour pressures are identical whether determined by static or dynamic methods, and that if any difference at all exists between the vapour pressure at the b. p., as measured statically and dynamically, of water and alcohol, such difference does not exceed 0·01 mm. of mercury.

E. G.

Convenient Form of Apparatus for the Measurement of the Vapour Densities of Easily Volatile Substances. ALAN W. C. MENZIES (*J. Amer. Chem. Soc.*, 1910, 32, 1624—1628).—The apparatus described is a slight modification of that recommended by the author for the determination of molecular weights of dissolved substances (preceding abstract). The test-tube is closed at the lower end by the introduction of 6—8 c.c. of mercury, which also serves, by its rise in the gauge-tube, to indicate the increase of pressure in the test-tube. The substance, the vapour density of which is to be determined,

placed in small glass bulbs, each provided with a capillary which is sealed off before the final weighing. The bulb is attached to the lower end of the stopper of the test-tube by inserting the point of the capillary into a hole drilled in the stopper and wedging it in with a few shreds of dry asbestos. The hole is made in an oblique direction, so that the neck of the bulb may be broken by rotating the stopper in such a way as to force the bulb against the top of the gauge-tube.

In order to obtain a constant for the apparatus, a quantity of benzene sufficient to give a rise in the mercury level of about 100 mm., is weighed in a small bulb and the latter is attached to the stopper of the test-tube. A liquid of suitable b. p. is placed in the outer tube and caused to boil steadily, so that its vapour surrounds the whole of the closed portion of the test-tube. As soon as the mercury in the gauge-tube has attained constant level, the stopper of the test-tube is rotated in order to break the neck of the small bulb, which falls on to the surface of the mercury. The mercury instantly rises in the gauge-tube and reaches a constant level in a few seconds. The rise in the mercury column is observed, and a correction made by adding the amount of the slight fall of the level of mercury in the test-tube. From the data (1) weight of benzene taken, (2) molecular weight of benzene, and (3) rise of mercury in mm., the required constant K is calculated, representing the rise in mm. which would be caused by the volatilisation of one gram-mol. of any substance in the apparatus at the particular temperature.

The molecular weight of a substance can be calculated by means of the formula $M = WK/R$, where R is the rise of the mercury in mm., and W the weight of substance taken.

The apparatus is compact and can be easily manipulated. It is not suitable for temperatures above 200° , but determinations are quoted which show that the method is both rapid and accurate at other temperatures.

E. G.

Fall of Temperature in Vapours of High Molecular Complexity at Small Pressures. C. VON RECHENBERG (*Zeitsch. physikal. Chem.*, 1910, 75, 628—636).—Polemical against Hansen (*Abstr.*, 1910, ii, 827). No new facts are adduced. G. S.

Critical Phenomena in Solutions under the Kardioid Ultra-microscope. W. G. VON LEPKOWSKI (*Zeitsch. physikal. Chem.*, 1910, 75, 608—614).—The ultramicroscope, in its latest improved form, has been employed to elucidate the nature of the opalescence in binary mixtures in the critical region. The results are, on the whole, in favour of Donnan's theory (*Abstr.*, 1904, ii, 240) that the opalescence is due to minute drops.

A mixture of amylene and aniline, critical temperature $14.2-14.5^\circ$, was used for the experiments. On cooling progressively from room temperature, 20° , a grey field with a clear circle in the middle was observed; at a certain point the previously clear field appeared as a rapidly agitated mass, in which separate particles could not be distinguished. As the temperature is further lowered (but still above the critical temperature), the flickering becomes still more pronounced, the

ultramicroscopic particles moving with enormous velocity. Suddenly, relatively large drops appear, and the critical temperature is reached. The phenomena appear in the converse order on warming. Particles from the small drops are projected into the bulk of the liquid with enormous velocity ; the drops become smaller and smaller, and finally disappear. The remarkable observation was made that when a relatively large drop is warmed until it has disappeared, and even the flickering has stopped, it reappears on cooling at the same point and with the same contours. This phenomenon occurs repeatedly on warming and cooling. It may be taken as showing that the rate of diffusion in the critical region is very small.

G. S.

Sublimation Apparatus. EMIL DIEPOLDER (*Chem. Zeit.*, 1911, 25, 4).—The apparatus consists of a wide glass tube sealed at the lower end, and closed at the upper by a rubber cork carrying two tubes, one of which serves for the entrance of air or other gas, whilst the other is attached to a wider tube which fits accurately into the outer closed tube and acts as a receptacle for the sublimate.

The substance to be sublimed is contained in a small beaker placed at the bottom of the outer tube.

The apparatus may be used for sublimation either at the ordinary or under diminished pressure.

F. B.

Thermochemical Studies of Some Binary Compounds of the Alkali and Alkali-earth Metals. ROBERT DE FORCHAND (*Compt. rend.*, 1911, 152, 27—31).—The author has collated in tabular form the best existing data for the heats of dissolution and formation of the chlorides, bromides, iodides, fluorides, and oxides of calcium, strontium, barium, lithium, sodium, potassium, rubidium, and cesium. Determinations of the heats of dissolution of the following anhydrous compounds were made to complete the series. The values are in Calories. $\text{CaI}_2 + 28.12$, $\text{LiF} - 1.04$, $\text{RbCl} - 4.50$, $\text{RbBr} - 5.96$, $\text{RbI} - 6.50$, $\text{RbF} + 5.80$, $\text{CsCl} - 4.68$, $\text{CsBr} - 6.73$, $\text{CsI} - 8.25$, $\text{CsF} + 8.37$. The data are discussed from the point of view of Berthelot's principle of maximum work.

W. O. W.

Thermochemistry of the Silicates. EMIL DITTLER (*Zeitsch. anorg. Chem.*, 1911, 69, 273—304. Compare Abstr., 1909, ii, 970).—The difficulties of obtaining correct cooling and heating curves in the case of silicates, owing to the suspended transformation effects, are fully discussed, and the precautions which must be taken are enumerated. Thermal and optical measurements on diopside from Zermatt, adularia from St. Gotthard, oligoclase-albite from Wilmington (Delaware), labradorite from Kiew, an artificial labradorite, artificial anorthite, and anorthite from Pizmeda are given.

Owing to the extremely small velocity of melting, the absorption of heat at the melting point is not the chief factor in the heating curve, so that with different velocities of heating the melting point will occur at different points in the curve. Melting point determinations on large fragments must be avoided, since they are more readily superheated than a fine powder and thus give higher results.

Geologically, freezing points are more important than melting points, and are generally lower than the latter, owing to undercooling. The temperatures at which crystallisation begins to take place in various minerals are as follows: artificial diopside, 1290—1250°; artificial abradorite, 1230°; labradorite from Kiew, 1200—1160°; artificial morthite, 1310°; anerthite from Pizmeda, 1200°. The temperatures at which crystallisation is complete could not be determined.

T. S. P.

Determinations of the Law of Chemical Attractions between Atoms from Physical Data. RICHARD D. KLEEMAN (*Phil. Mag.*, 1911, [vi], 21, 83—102).—From data of Ramsay and Young, and Mills relating to surface tension and latent heat of benzene, chlorobenzene, carbon tetrachloride, and methyl formate, and to the critical density of ethyl ether, β -dimethylbutane, β -dimethylhexane, isopentane, pentane, *n*-hexane, *n*-heptane, *n*-octane, benzene, cyclohexane, fluorobenzene, chlorobenzene, bromobenzene, iodobenzene, carbon tetrachloride, and stannic chloride, various consequences of the mathematical expressions deduced in previous papers are tested. F. S.

Recovery of Hammered Materials. LÉON GUILLET (*Compt. rend.*, 1910, 151, 1127—1128).—Experiments on hard and soft steel and on nickel show that complete recovery on annealing, characterised by attainment of maximum length, occurs in each case at 750—800°. The curves showing elasticity on traction exhibit two elastic limits, one constant and characteristic for the metal in the ordinary state, the other variable with the temperature of recovery. The metals in this respect behave as heterogeneous materials of which only one constituent shows the effects of hammering. W. O. W.

Some Abnormal Temperature-coefficients of the Molecular Surface Energy of Organic Substances. PAUL WALDEN (*Zeitsch. physikal. Chem.*, 1910, 75, 555—577).—According to the Eötös-Ramsay-Shields rule, the temperature-coefficient of the molecular surface energy, $d[\gamma(Mv)^{\frac{2}{3}}]/dt$, is about 2·121 for unimolecular substances, for associated substances it is less, and for dissociated substances greater. The author now finds that the coefficient in question is 6·21—5·35 for tristearin and 5·57—4·92 for tripalmitin, between 60° and 120°, whereas the molecular weights, according to cryoscopic determinations with a number of organic solvents, are normal. The coefficient for the isobutyl ester of ricinoleic acid amounts to 3·24—3·30 between 23° and 85°, whilst its molecular weight is normal. The above rule therefore does not hold even approximately, and the deviations appear to be the greatest for complex substances of high boiling point. The surface-tension of solutions of tripalmitin and tristearin in benzene has also been measured. The average value of the coefficient for both solutions calculated according to the mixture rule is about 2·18; the solutions therefore behave as non-associated and non-dissociated liquid systems.

On the other hand, two hydroxyl-free solvents with abnormally small coefficients of molecular surface energy, succinonitrile and formamide,

have been investigated. From the results of surface-tension measurements, the coefficient for the nitrile between 80° and 100° is 0·555, indicating a molecular complexity of 7·27, from 100—118° it is 0·601, the complexity being 6·63. For formamide, between 5° and 60°, the coefficient varies from 0·638 to 0·710, corresponding with a molecular complexity of 6·75—5·17. The conclusion that these two compounds are highly associated is confirmed by cryoscopic and ebullioscopic measurements.

G. S.

The Viscosity of Dispersoids. EMIL HATSCHEK (*Zeitsch. Chem. Ind. Kolloide*, 1911, 8, 34—39). Compare this vol., ii, 19).—On the basis of certain assumptions relating to the form and distribution of the disperse phase in the dispersive medium, the author has examined the changes which should result from the disturbance of the normal arrangement of the disperse phase as a consequence of the relative movement of juxtaposed layers of an emulsion, and has deduced a relationship between the viscosity of the emulsion and that of the dispersive medium.

The effect of this relative movement, such as is involved in the flow of the emulsion through capillary tubes, is dependent on the relative magnitudes of the surface tension and the viscosity of the disperse phase if the proportion of this is very large, and a decrease in the viscosity of the disperse phase is shown to be accompanied in certain circumstances by an increase in the viscosity of the emulsion.

For a disperse system of this type, there is a critical velocity of displacement of juxtaposed layers at which an abrupt change takes place in the viscosity, and this velocity is determined by the rate at which the particles of the disperse phase regain their original structural form when deformed as a result of the lateral displacement of these layers. For velocities of displacement greater than this critical value, the relationship between the viscosity of the emulsion and that of the dispersive medium is expressed by $\eta_1 = \eta \sqrt{\gamma} / (\gamma - 1)$, in which η_1 and η are the viscosities of the emulsion and the dispersive medium, and γ is the ratio of the volume of the emulsion to that of the disperse phase. For velocities of displacement smaller than the critical value, the mathematical treatment of the question presents difficulties, but it is shown that the viscosity of the system under these conditions must be greater than for greater velocities.

H. M. D.

The Phenomenon of Agglomeration in Finely Powdered Substances. M. C. SCHUYTEN (*Chem. Zeit.*, 1910, 34, 1357).—A sample of pure iron powder, kept for fifteen years in a well stoppered bottle, which had not undergone oxidation, had formed a globular mass with a peculiar goose-neck shaped excrescence.

Barium sulphate, prepared by mixing equivalent proportions of solutions of barium chloride and ammonium sulphate, gradually formed conical excrescence, reaching a length of 6—7 cm. The author ascribes these phenomena to physical actions.

L. DE K.

Globular Appearance of Certain Precipitates. FRIEDRICH BARDAUCH (*Chem. Zeit.*, 1911, 35, 33).—The globular or flocculent

appearance assumed by finely divided substances, such as precipitated barium sulphate, etc., has been fully discussed by Quincke (*Abstr.*, 1902, ii, 200) and others, who attribute the phenomenon to the action of osmotic pressure, surface tension, etc. The outer surface of the flocks has a characteristic appearance, whilst the interior frequently exhibits a cell-like structure.

W. P. S.

Parallelism between the Occurrence of Cohesion and the Conditions Necessary for Dyeing. AUGUSTE ROSENSTEINH (*Bull. Soc. chim.*, 1911, [iv], 9, 12–18. Compare *Abstr.*, 1909, ii, 756).—A number of cases are quoted showing that the conditions under which cohesion occurs between the same or different substances are exactly analogous to those under which the dyeing of fabrics takes place, and it is suggested that cohesion between dye and fabric plays the principal rôle in this operation, although chemical affinity between dye and fabric may also be operative.

T. A. H.

Deduction of the General Phase Theorem for Adsorption Systems. P. N. PAWLOFF (*Zeitsch. physikal. Chem.*, 1910, 75, 552–554).—The form of the phase rule for a system capable of adsorption is deduced mathematically; it is similar to that for a system in which adsorption does not occur. Condensed disperse systems capable of absorption have six kinds of variables, whereas colloidal adsorption systems are characterised by seven variables.

G. S.

A New Proof of the Existence of an Adsorption Equilibrium in Hydrosols. ALFRED LOTTERMOSER and P. MAFIA (*Ber.*, 1910, 43, 3613–3618).—Experimental results are recorded in support of the view that electrolytes are adsorbed by hydrosols in accordance with an exponential law. Freshly precipitated ferric hydroxide was dissolved in ferric chloride solution, and a portion of the electrolyte removed by filtration through collodion. The contents of the filter were then diluted with water, and the solution again filtered, this process being repeated until a hydrosol containing relatively little chlorine was obtained. From this hydrosol a series of others were prepared by addition of varying quantities of water, and each of these was then subjected to filtration through collodion. The chloride in the various filtrates was estimated, and by difference the adsorbed chloride was ascertained. Denoting by c the number of millimols. of chlorine per c.c. of the filtrate, and by x/m the millimols. of chlorine adsorbed by one gram of ferric oxide, it is found that the experimental data can be satisfactorily represented by the equation: $x/m = \beta \cdot c^{1/p}$, in which $\beta = 2.83$ and $1/p = 0.163$ are constants. Similar results were obtained in the investigation of a ferric oxide hydrosol prepared by addition of ammonium carbonate to a solution of ferric chloride.

H. M. D.

"Anomalous" Adsorption. WILLIAM M. BAYLISS (*Zeitsch. Chem. Ind. Kolloide*, 1911, 8, 2–4).—The so-called "anomalous" adsorption recently observed by Biltz and Steiner (*Abstr.*, 1910, ii, 830) can be accounted for on the basis of the author's observations on "electric

adsorption" (Abstr., 1906, ii, 344). In these experiments filter paper was the adsorbent, and this becomes negatively charged in contact with water. In consequence of this electric charge, electro-positive colloids are attracted by the paper, whilst electro-negative colloids are repelled. In presence of neutral salts, the negative charge is partly or completely neutralised by the cation, and as a result the adsorption of electro-negative colloids is facilitated, whilst that of electro-positive colloids is hindered. This neutral salt action explains the absence of "anomalous" adsorption in the experiments of Biltz and Steiner, when dialysed night-blue was used instead of the commercial substance. It also accounts for the approximately normal adsorption observed in the experiments in which dilute solutions of the dye were examined.

H. M. D.

Capillary Analysis of Colloidal Solutions. NAIMA SARLONI (*Koll. Chem. Beihefe*, 1910, 2, 79—141).—The behaviour of colloidal solutions of a number of inorganic substances has been investigated by observations of the capillary effects produced when long strips of filter paper are supported with the lower edges immersed in the solutions. It has been found that the positive colloids are precipitated at the surface of contact, whereas negative colloids rise through the capillary network without hindrance. The precipitation of the positive colloids is not due to chemical action, but to the setting up of an *E.M.F.* as a consequence of the streaming of the liquid through the capillaries; this potential difference brings about the discharge of the positively charged colloidal particles. If the capillaries are not sufficiently narrow, the resulting *E.M.F.* is not large enough to give rise to complete precipitation, and a rise of the positive colloid is observed.

A detailed examination of the phenomena observed in the case of colloidal ferric hydroxide has shown that the free acid present in an incompletely dialysed solution prevents complete precipitation. Addition of acid to a completely dialysed hydrosol has the same effect. The capillary phenomena exhibited by solutions of colouring matters are in many cases closely similar to those observed with inorganic colloids.

H. M. D.

Capillary Electrical Precipitation of Positive Colloids. FRITZ FICHTER (*Zeitsch. Chem. Ind. Kolloide*, 1911, 8, 1—2. Compare preceding abstract).—The precipitation of positive colloids as a result of the production of electrical forces by diffusion through capillary tubes has been further examined by experiments with parallel glass plates. When a drop of a dialysed colloidal solution of ferric hydroxide is placed on one of the plates, and the second plate is allowed to sink slowly on to the former, it is found that the thin layer of solution between the plates exhibits a sharply defined circular opalescent zone in consequence of the precipitation of the positive colloid. A similar phenomenon is observed with colloidal solutions of chromic oxide, zirconium dioxide, and thorium dioxide. With coloured solutions of basic dyes, such as night-blue and methylene-blue, the visible effect is still more pronounced.

From the dimensions of the circular zone of precipitation and the

weight of the solution between the plates, the critical distance between the plates requisite for the production of the precipitation can be calculated. In the case of ferric hydroxide, this was found to be 0·0322, but this is very much smaller than the value (0·075 mm.) expected on the basis of experiments with capillary tubes. The much smaller value is probably due to mechanical displacement of the precipitation zone when the plates are brought together.

In similar experiments with solutions of negative inorganic colloids and acid dyes no precipitation effects are observed. H. M. D.

Origin of Internal Pressure in Solutions. V. POLOWZOFF (*Zeitsch. physikal. Chem.*, 1910, 75, 513—526).—According to Tammann (*Innere Kräfte und Eigenschaften der Lösungen*, Leipzig, 1907), the greater internal pressure in a solution as compared with the pure solvent is due to attraction between solvent and solute, and is of the same nature in electrolytes and non-electrolytes. Drude and Nernst (*Zeitsch. physikal. Chem.*, 1894, 15, 79), on the other hand, ascribe the increased pressure, at least in the case of electrolytes, to the effect of the electrostatic field of the ions (theory of electrostriction), and in accordance with this view, it has been found that the complete ionisation of a mol. of a binary salt is attended by a contraction (resulting from the increase of pressure) of 13—14 c.c. In the present paper, further evidence is advanced in favour of the electrostriction theory.

From observations on the density of solutions of monochloroacetic acid in different dilutions, the degree of dissociation of the salt being known, it is calculated that the complete ionisation of a mol. of the salt is attended by a contraction of about 10 c.c. On the other hand, the apparent molecular volume of ethyl alcohol in benzene only varies slightly from dilute to very concentrated solutions, although the molecular complexity greatly diminishes on dilution. This is difficult to reconcile with Tammann's theory, as an increase in the number of molecules should cause increased attraction between solvent and solute, and therefore increased internal pressure and consequent contraction. The data of Ritzel (*Abstr.*, 1907, ii, 740) on the compressibility of solutions of ethyl alcohol in benzene are also in favour of the view that the internal pressure does not increase on dilution. Finally, it is shown by an indirect method that the dissociation of amyl acetate into amyleno and acetic acid is attended by an increase and not by a diminution of volume. This is in agreement with Nernst's theory—as no ions are concerned there can be no electrostriction.

The electrostriction theory cannot of course account for the increased internal pressure caused by dissolution of non-electrolytes, such as the sugars and glycerol, in water; these solutions require further investigation. G. S.

Influence of Foreign Substances Dissolved in the Mother Liquor on the Faces of Crystals of Meconic Acid and on their Pseudopolychroism. PAUL GAUBERT (*Compt. rend.*, 1910, 151, 1134—1136. Compare *Abstr.*, 1906, ii, 152).—Meconic acid occurs in orthorhombic, hemimorphic crystals having curved faces and

showing marked double refraction [$a:b:c = 0.613:1:0.900$; $\alpha = 63^\circ$, $\beta = 138^\circ$]. Addition of different substances to the solution in which the crystals are growing may modify the crystalline form to a considerable degree; thus, picric acid produces elongation in the direction of the axis a , whilst methylene-blue elongates the axis b . The extent of elongation depends on the amount of foreign matter absorbed by the crystal. A large quantity of methylene-blue produces hemimorphism, the crystals being H-shaped. Addition of carbamide to the mother liquor causes the crystals to exhibit pseudopolychroism when viewed through a Nicols' prism. This appears to be due to the presence of microscopic bubbles which produce partial absorption through repeated reflexion.

W. O. W.

Theory of the Phenomena of Transition between Colloidal and True Solutions. P. P. VON WEIMARN (*Zeitsch. Chem. Ind. Kolloide*, 1911, **8**, 24—33).—A theoretical paper in which the author discusses the relationships between unsaturated, supersaturated, and colloidal solutions in reference to the action of the dispersive and coagulating forces. The hydrosols of slightly soluble substances are qualitatively differentiated from the corresponding unsaturated solutions by the fact that continuous condensation takes place in the former. In accordance with this view, the disperse particles are not amorphous, but are characterised by vectorial structure. The forces which determine the vectorial arrangement are peculiar to the molecules, and the play of these forces is not inhibited by the excessive development of the surface which is characteristic of colloidal systems.

Observations relating to the precipitation of supersaturated solutions of barium sulphate are cited in support of the author's views.

H. M. D.

The Micellary or "Colloidal" State. GIOVANNI MALFITANO (*Koll. Chem. Beihefte*, 1910, **2**, 142—212).—A theoretical paper in which the relationships and differences between the colloidal and crystalloidal states and between the processes of coagulation (flocculation) and crystallisation are examined. In part, the theoretical considerations have reference to experimental observations published previously (Abstr., 1909, ii, 473) on the behaviour of solutions of ferric chloride.

H. M. D.

The Saturation Capacity of Colloidal Compounds. WALTHEË SPRING (*Bull. Soc. chim. Belg.*, 1910, **24**, 446—453; *Arch. Sci. phys. nat.*, 1910, [iv], **30**, 561—571).—Observations relating to the influence of saponin on suspensions of soot in water are described, which seem to show that the capacity of colloidal substances to form complex aggregates is limited, in a similar way to that observed in the case of chemical combination.

From preliminary experiments with solutions of saponin, it appears that this substance occupies a position intermediate to the colloids and crystalloids. Its solutions show the Tyndall effect, and under the

Influence of a current the saponin moves towards the anode : on the other hand, dialysis experiments show that it undergoes diffusion.

To ascertain the influence of saponin on the durability of soot suspensions, solutions containing from 7·5 to 0·0045% of saponin were shaken up with the same quantity of soot, carefully freed from fatty matter by extraction with benzene, and the times required for the clarification of the solutions were observed. From these data it appears that a solution containing between 2·5 and 3% of saponin is most favourable to the persistence of the suspension. If the solutions are made either slightly acid or alkaline, clarification takes place in all cases very quickly, and there is no optimum effect. When a current is passed through the most durable suspension, the soot migrates to the anode, although a pure aqueous soot suspension shows the opposite effect. This indicates the formation of colloidal aggregates as a result of the adsorption of saponin by the soot. The effect of saponin on the behaviour of suspensions of soot when subjected to filtration has been examined, and it appears that the adsorption of the soot by other substances, such as filter-paper, is to a large extent prevented by reason of the formation of soot-saponin aggregates. The view that the formation of colloidal aggregates or adsorption compounds is limited by a definite saturation capacity, is supported by this and a number of other observations of similar character which are described in detail.

H. M. D.

Colloidal Chemistry and the Phase Rule. W. P. A. JONKER (*Zeitsch. Chem. Ind. Kolloide*, 1911, 8, 15—18).—The applicability of the phase rule to colloidal systems is discussed, and the conclusion drawn that the relatively large amount of surface exhibited by colloidal substances is without influence on the nature of the equilibrium relationships from the phase rule point of view. The coagulation of colloids is not comparable with the separation of a liquid into two layers, for the former process is not accompanied by an increase in the number of phases. Objection is taken to the introduction of surface tension as a new independent variable in the consideration of colloidal systems, for surface tension is quite different in character from temperature and pressure, in that its magnitude cannot be varied at will.

In reference to the connexion between the amorphous and crystalline states, it is stated that realgar is a suitable substance for experimental investigation. This can be obtained in amorphous or crystalline form by melting together equivalent quantities of sulphur and arsenic. The crystalline variety melts at 320°, whereas the amorphous becomes liquid at about 130°, and when heated to 350° its properties change in a continuous manner. These observations are cited as evidence in support of the view that the amorphous and crystalline forms are to be regarded as distinct phases. H. M. D.

The Equilibrium between Potassium Hydrogen Carbonate and Trihydrated Magnesium Carbonate. NANTY (*Compt. rend.*, 1910, 151, 1352—1354).—Polemical against Engel (Abstr., 1886,

121) and Buchner (*Zeitsch. Elektrochem.*, 1908, 14, 63). The author has re-examined the conditions of equilibrium in the reaction
 $\text{KHCO}_3 + \text{MgCO}_3 \cdot 3\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{MgCO}_3 \cdot \text{KHCO}_3 \cdot 4\text{H}_2\text{O}$,
and is unable to confirm the existence of two distinct limits of formation and decomposition for the reverse reactions at 20–30°. For the same temperature, at constant pressure, the actions appear to converge towards a common limit.

W. O. W.

Electron Conception of Valency. K. GEORGE FALK and JOHN M. NELSON (*J. Amer. Chem. Soc.*, 1910, 32, 1637–1654).—Thomson's hypothesis, that each linking between the atoms of a compound is due to the transference of a negatively-charged corpuscle from one atom to the other, is considered in its application to various classes of organic compounds, and references to its application to inorganic compounds are quoted from the papers of Noyes (*Abstr.*, 1908, ii, 349) and Ramsay (*Trans.*, 1908, 93, 774). It is shown that all cases of isomerism, connected with the presence of a double bond, whether between like or unlike atoms, can be interpreted on the basis of the direction of the valencies (that is, the direction of transference of the corpuscles) without recourse to spatial configurations. The theory of directive valencies is also employed to account for the existence of certain isomerides, and to account for certain reactions which have not been explained previously.

E. G.

Stokes's Formula. MAX REINGANUM (*Ber. Deut. physikal. Ges.*, 1910, 12, 1025–1038).—In view of the frequent application of Stokes's formula in the calculation of the diameters of small particles from observations on their velocities of movement under the influence of a known force, the author has examined the conditions under which this formula holds good. For very small particles, such as the ions in gases, the formula is not valid, and it is shown that the determination of the dependence of the velocity of such particles on the pressure of the gas may be used as a means of ascertaining whether Stokes's equation is applicable or not. In the use of the small metallic particles investigated by Ehrenhaft (*Physikal. Zeitsch.*, 1910, 10, 318, 940), the uncorrected equation is inapplicable, and the calculated diameters of the smallest particles are in consequence incorrect.

On the assumption that the small particles can be regarded as elastic spheres similar to gas molecules, the author deduces a new formula connecting the radii of the spheres and their velocity of movement. According to this, the radius of the particles is proportional to the velocity, whereas in Stokes's formula the radius is proportional to the square-root of the velocity. For a given radius the new formula shows that the velocity is inversely proportional to the density of the gaseous medium, but according to the older formula the density of the gas is without influence on the velocity of the particles.

From the data of Ehrenhaft, the dimensions of the particles calculated from the two formulae are compared. In the case of gold and platinum the calculated values are nearly the same for the larger

particles, but the author's formula gives much smaller values for the radii when the most slowly moving particles are considered.

H. M. D.

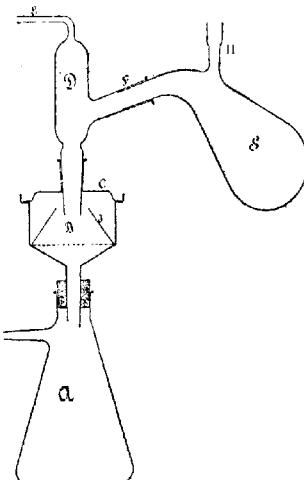
Automatic Rapid Mercury Pump for High Vacua. A. BECTELL (*Chem. Zeit.*, 1910, 34, 1342—1343).—With one of the author's mercury pumps a vacuum of 0·0007 mm. can be obtained in ten minutes, and one of 0·0001 mm. in twenty minutes, whilst after twenty-five minutes it was impossible to measure the vacuum with a McLeod gauge. Only 0·29 kg. of mercury is necessary to work the pump.

A photograph of the pump, as mounted, is given, but no details.

T. S. P.

A Modified Separating Funnel and Washer for Heavy Liquids. HARFORD M. ATKINSON (*Chem. News*, 1910, 102, 308).—The funnel consists of an ordinary tap funnel, with a second tap and short tube inserted about half-way up the side of the bulb. The washing liquid, etc., can be run off by this side tap, and further washings performed without running off the heavy liquid. The drying with calcium chloride can also be carried out in the funnel. N. C.

Filtering Apparatus for Substances which are Hygroscopic or Altered by Exposure to Air. WILHELM STEINKOFF (*Chem. Zeit.*, 1910, 34, 1358).—On the suction flask, *A*, is placed a Büchner funnel, *B*, having a ground flange, the edge of which is turned upwards to prevent the lid from slipping; the funnel is closed by means of a ground-glass lid, *C*, furnished with a neck. Into this fits the adapter, *D*, which has a tube, *E*, bent at right angles, and a side tubulus, *H*, into which the neck of the reaction flask, *G*, is ground. This neck is bent at such an angle that when the bulb of the flask is turned upwards, the contents, liquid and precipitate, readily flow into *D*. The neck of the flask, *G*, also has a tubulus, *H*, which during the reaction proper may be connected with a reflux condenser or a gas-delivery tube, but during filtering is fitted with a separating funnel containing the washing liquid. *H* is placed not in the position shown in the diagram, but so much to one side that



the contents will not run into it when the flask is rotated in *F*. To prevent moisture entering during the filtration, phosphoric oxide tubes are attached to *E* and to the side-tube of *A*, leading to the pump. As the solvents used are generally ether, benzene, light petroleum, and the like, it is advisable to place on the dry filter paper a cut and ground inverted funnel, *J*, which keeps the paper in position and also prevents any splashing of the precipitate on to the sides of the Büchner funnel. If desired, an inert gas can be transmitted through *E*. L. DE K.

Automatic Extraction of Aqueous Liquids by Organic Solvents of Lower Density. RICHARD KEMPF (*Chem. Zeit.*, 1910, 34, 1365—1366).—The apparatus consists of a flask surmounted by two tubes placed concentrically to one another; the vapour from the boiling ether, etc., passes through the annular space between the tubes to a condenser. The condensed ether drops into a funnel tube which is placed concentrically in, and reaches to the bottom of, the inner tube, which is closed below and contains the liquid to be extracted. A flat glass spiral is twisted round the stem of the funnel, like an ascending stair, and so forces the ether into intimate contact with the liquid to be extracted as it ascends through it. The ether collects on the surface of the aqueous liquid, and flows through two openings in side of the inner tube back into the flask below. L. DE K.

Apparatus for Preserving and Measuring Poisonous, Hygroscopic, or Low-boiling Liquids. WILHELM STEINKOPF (*Chem. Zeit.*, 1910, 34, 1319).—The liquid under investigation, for example, anhydrous hydrogen cyanide, is directly distilled into the cylindrical vessel in which it is to be preserved. Sealed into this vessel is a narrow tube reaching down to the bottom and connected with a measuring tube through a stopcock. Another tube containing a stopcock is also sealed into the top of the vessel, and by connecting this tube with a source of pressure, the liquid in the vessel may be forced over into the measuring tube, the various stopcocks being appropriately manipulated.

The whole apparatus is made of glass.

T. S. P.

Aluminium Apparatus for Use in the Laboratory. HUGO MASTBAUM (*Chem. Zeit.*, 1910, 34, 1319).—Condensing spirals made of aluminium tubing are very serviceable in distillations occurring in wine and brandy analyses. Boilers of the same material may also be used in the production of steam for distillations. T. S. P.

A New Apparatus for the Preparation of Liquid and Solid Air for Demonstrations. MAX BAMBERGER (*Oesterr. Chem. Zeit.*, 1910, [ii], 13, 137—138).—The paper contains a sketch, with a description of an apparatus suitable for the production of small quantities of liquid air. It consists of two series of copper tubes and a steel flask; the apparatus is cooled and the enclosed air subjected to a pressure of 120 atmospheres. F. M. G. M.

Inorganic Chemistry.

Reactions in the Presence of Nickel. (a) Inability of Nitrogen and Hydrogen to Combine in Presence of Nickel. (b) Reduction of Oxides of Nitrogen, Sulphur, and Phosphorus in Presence of Nickel. PAÑCHÁN NÉOGI and BIKENDRA BHUJAN ADHIKÁRY (*Zeitsch. anorg. Chem.*, 1910, 69, 209–214).—A mixture of nitrogen and hydrogen (1 : 3 or 1 : 6 by volume) does not give rise to the formation of ammonia when passed over heated reduced iron, the temperature varying from dull to bright red heat. Similar negative results are obtained when the reduced iron is replaced by pure iron wire or by ferric oxide, no matter whether the gases are dried or not (compare Ramsay and Young, *Trans.*, 1884, 45, 93). No ammonia could be detected when the iron was replaced by reduced nickel, nickel wire, or electrolytic nickel.

When a mixture of nitric oxide and hydrogen (1 : 3 or better 1 : 4) is passed over reduced nickel, the nitric oxide is almost quantitatively converted into ammonia. The reaction begins at 300°, but once it has set in the temperature may be lowered to 120°.

Hydrogen sulphide is formed when a mixture of sulphur dioxide and hydrogen is passed over nickel heated to a dull red heat. The hydrogen sulphide is probably formed partly by direct reduction of the sulphur dioxide, and partly by reduction of nickel sulphide formed by the interaction of nickel and sulphur dioxide.

Hydrogen phosphide is produced when hydrogen is passed over a mixture of phosphoric oxide and reduced nickel at a dull red heat.

T. S. P.

Catalysis of Hydrogen Peroxide. ERNST H. RIESENFELD (*Ber.*, 1911, 44, 147–150. Compare *Abstr.*, 1908, ii, 951).—The reaction between chromic acid and excess of hydrogen peroxide can be represented by the equation: $4\text{H}_2\text{Cr}_2\text{O}_7 + 7\text{H}_2\text{O}_2 = \text{Cr}_2(\text{Cr}_2\text{O}_7)_3 + 11\text{H}_2\text{O} + 5\text{O}_2$. This agrees with Spitalsky's statement that only about 28% of the chromic acid is reduced, but this author did not notice that all the free acid is used up. The reaction is not a catalytic process (compare Spitalsky, this vol., ii, 36, 37). J. J. S.

Raschig's Nitrososulphonic Acid, "Blue Acid." WILHELM MANCHOT (*Zeitsch. angew. Chem.*, 1911, 24, 13–14. Compare *Abstr.*, 1910, ii, 956, 1058).—Mainly a reply to Raschig (*Zeitsch. angew. Chem.*, 1910, 23, 2248). Raschig's ferric nitrososulphonate should have the ratio NO : Fe = 1.5 : 1, whereas the actual proportion is 2 : 1. It is pointed out that there is no trace of evidence for the existence of a blue compound formed by the union of nitric oxide with sulphuric acid. J. J. S.

Products Formed when Phosphoric Oxide Dissolves in Water. D. BALAREFF (*Zeitsch. anorg. Chem.*, 1910, 69, 215–216).—Phosphoric oxide was allowed to deliquesce over (1) 75% sulphuric

acid, (2) 9% sulphuric acid ; some was also thrown into water. In the first two cases the reaction was considered to be complete when the snow-like appearance of the phosphoric oxide has disappeared. In all cases metaphosphoric acid was the only product of reaction. After eighteen hours the metaphosphoric acid had completely changed into the ortho-acid in the last two cases.

The velocity of hydration of metaphosphoric acid produced by the deliquescence of phosphoric oxide is much greater than that of the metaphosphoric acid obtained by heating orthophosphoric acid.

T. S. P.

Rate of Hydration of Pyrophosphoric Acid. A Correction. G. A. ABBOTT (*J. Amer. Chem. Soc.*, 1910, 32, 1576—1577).—In a paper on this subject (Abstr., 1909, ii, 661), it was stated that the specific conductivity of a mixture of pyro- and ortho-phosphoric acids is a linear function of its composition. It has been pointed out to the author that the experimental data quoted were not consistent with this statement, and it has been found that the wrong data were inadvertently given. The correct data are now recorded. Corrections are also given for certain typographical errors which occurred in Abbott and Bray's paper (Abstr., 1909, ii, 660) on the ionisation relations of ortho- and pyro-phosphoric acids and their sodium salts,

E. G.

New Determinations of Some Constants of the Inert Gases. CLIVE CUTHBERTSON (*Phil. Mag.*, 1911, [vi], 21, 69—77).—Recent determinations of (1), the viscosity at different temperatures and (2) the refraction and dispersion of the argon gases, afford independent sets of measurements of the fraction of the volume containing the gas, which its molecules actually occupy. For argon, krypton, and xenon, the values in absolute measure so found by the two methods are of the same order, and there is a constant ratio between them ; the volumes calculated from the viscosity being about 1.75 times that calculated from the refractivity. For helium and neon the ratios are 3.0 times and 2.53 respectively. For oxygen and nitrogen the ratios are similar to that found for argon, but hydrogen departs widely from it. For all the gases the numbers of "dispersion electrons" in the atoms, calculated from the refractivities and dispersions by means of Sellmeier's formula, bear a linear relation to the reciprocals of the radii of the spheres of action of the atoms as calculated from the viscosity. The squares of the numbers of "dispersion electrons" are for all the gases proportional to the radii of the spheres of action diminished by a constant equal to 0.95 of the radius of the sphere of action of helium at 0°. The squares of the relative numbers of "dispersion electrons" plotted against the critical temperatures of the gases fall on a straight line passing near the origin. From this relation the unknown critical temperature of neon is calculated to be about 46° A. The radii of the spheres of action also bear a linear relation to the critical temperatures. These results suggest that the electric charges which influence dispersion control also the critical temperature and the temperature-coefficient of viscosity, and show that

Sellmeier's formula, which is, in the manner of its derivation, tentative, can be safely employed to give results comparable with those obtained from the kinetic theory.

F. S.

A General Method for the Preparation of Anhydrous Chlorides. ÉDOUARD CHAUVENET (*Compt. rend.*, 1911, 152, 87—89. Compare Abstr., 1909, ii, 53).—The method consists in heating the oxide of the metal in a slow current of carbonyl chloride at a temperature varying from about 350° in the case of vanadium oxide to 650° in the case of thorium. Chlorides of the following elements have been prepared in this way: vanadium, tungsten, tantalum, titanium, zirconium, thorium, tin, barium, magnesium, zinc, glucinum, aluminium, iron, chromium, manganese, nickel, uranium, cerium, yttrium, lanthanum. An excellent yield of the anhydrous higher chloride was obtained in each instance, except with tungstic oxide, when the oxychloride was formed, and in the case of titanium, when a mixture of chloride and oxychloride was produced. The method is specially suitable for preparing the chlorides of the rare-earth metals. Silica is not attacked by carbonyl chloride.

W. O. W.

The Causes of the Differences in the Action of Sodium and Potassium on Water. MANINDRANATH BAXEREE (*Chem. News*, 1910, 102, 319—320).—When the metals are thrown on water, the hydrogen which is evolved is charged with the vapours of the metals, and so the motion is affected by their densities and molecular volumes, and those of their oxides and hydroxides. Thus in the case of potassium the high density and large molecular volume of its vapour counteract the motion of the hydrogen, its movement is retarded, the heat is not dissipated, and so the gas bursts into flame. In the case of sodium, the density and molecular volume being very low, the hydrogen keeps in a state of motion, and does not ignite, the heat being dissipated.

N. C.

The Miscibility of Glaserite with Sodium Sulphate and its Dependence on the Temperature. RICHARD NACKEN (*Sitzungsber. K. Akad. Wiss. Berlin*, 1910, 1016—1026. Compare van't Hoff and Barschall, Abstr., 1903, ii, 434).—From a study of the solidification of fused mixtures of sodium and potassium sulphates, it has been found that the hexagonal modifications of the enantiotropic dimorphous components, which separate out first, form a complete series of mixed crystals. As the temperature falls, these primary mixed crystals undergo transformation, and the diagrammatic representation of the resulting relationships shows that the formation of the hexagonal mixed crystals, which crystallise from aqueous solutions at low temperatures, is confined to certain concentrations of the components. The limiting concentration on the one side is represented by glaserite, $\text{Na}_2\text{SO}_4 \cdot 3\text{K}_2\text{SO}_4$ (76% K_2SO_4). The other limiting concentration corresponds with about 49% K_2SO_4 at 180°, but with fall of temperature this proportion of potassium sulphate diminishes.

Crystalline forms corresponding with these limiting concentrations are obtained, together with potassium or sodium sulphate, when fused

mixtures containing excess of potassium or sodium sulphate respectively are allowed to cool.

The relationships indicated by the concentration-temperature diagram have been supplemented by crystallisation experiments at 60° and 34°. When the aqueous solutions contain excess of potassium sulphate, glaserite and potassium sulphate are obtained. If excess of sodium sulphate is present, the crystals which separate consist of sodium sulphate together with mixed crystals containing glaserite and sodium sulphate, and the composition of these mixed crystals approximates towards glaserite as the temperature of crystallisation is lowered.

H. M. D.

Fusions of Alkali Metaborates and Metaphosphates. H. S. VAN KLOOSTER (*Zeitsch. anorg. Chem.*, 1910, 69, 122—134).—The freezing-point curve of mixtures of potassium metaborate and metaphosphate possesses two eutectics at 681° and 770° respectively, the former corresponding with 90% and the latter with 30% of potassium metaphosphate. The portions of the curve between the eutectics rises to a very flat maximum, extending between 50 and 60% of potassium metaphosphate. The eutectic arrest is only noticeable in the neighbourhood of the eutectics, so that it cannot be used to determine the position of the maximum. Investigation of the fusions showed that free borate could be detected by Tammann's reaction (characteristic red precipitate with mercuric chloride solution) up to 55% KPO_3 , so that the composition of the compound lies between 55 and 60% KPO_3 and is probably 59% KPO_3 , corresponding with $KPO_3 \cdot KBO_3$. Fusions of this composition give neutral solutions, whereas with higher and lower percentages of potassium metaphosphate they are respectively acid and alkaline. The presence of the compound $KPO_3 \cdot KBO_3$ is also indicated by the microscopic examination of thin sections. Between 65 and 85% potassium metaphosphate, the fusions would not crystallise, solidifying to a vitreous mass.

Potassium metaphosphate has m. p. 810°, and potassium metaborate melts at 947°.

The freezing-point curve of mixtures of sodium metaphosphate (m. p. 610°) and sodium metaborate (m. p. 966°) could only be followed between 0 and 30% and between 50 and 80% of sodium metaphosphate, the other mixtures solidifying to vitreous masses. The curve between 50 and 80% of sodium metaphosphate shows a flat maximum which is probably due to the existence of the compound, $NaPO_3 \cdot NaBO_3$, further evidence in support of the existence of which is given by chemical and optical investigations similar to those described for the potassium compounds. Conductivity measurements showed that this compound also exists in solution to some extent.

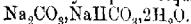
Sodium metaborate and potassium metaborate give a continuous series of mixed crystals, the freezing-point curve showing a flat minimum at 50% sodium metaborate. Indications of a decomposition of these mixed crystals at 522—553° were obtained in mixtures containing 40—60% of sodium metaborate.

Lithium metaborate (m. p. 843°) and sodium metaborate do not form a compound with each other, the freezing-point curve showing a eutectic

at 650° with 52% of lithium metaborate. The miscibility in the crystalline condition is very limited, the lithium metaborate dissolving 2% of the sodium metaborate, and the latter dissolving 3% of the lithium metaborate.

T. S. P.

Efflorescence of Washing Soda Crystals. ALEXANDER C. CUMMING (*Chem. News*, 1910, 102, 311).—The author examined a specimen of large crystals of washing soda which had been for at least twenty years in a glass case with a wooden floor. The case fitted closely, but was not air-tight. It was at first thought that the crystals now consisted of the trihydrate, the existence of which had not been previously known. Further analysis, however, showed that the crystals consisted almost entirely of pure sesquicarbonate,



The loss of weight on the ignition of the sesquicarbonate, if calculated as due entirely to water, would lead to the formula for the trihydrate.

N. C.

The Binary Systems: $\text{Li}_2\text{O}-\text{SiO}_2$, $\text{Li}_2\text{SiO}_3-\text{ZnSiO}_3$, $\text{ZnSiO}_3-\text{CdSiO}_3$, $\text{Li}_2\text{SiO}_3-\text{LiBO}_2$, $\text{Na}_2\text{SiO}_3-\text{NaBO}_2$, and $\text{Na}_2\text{SiO}_3-\text{Na}_2\text{WO}_4$. H. S. VAN KLOOSTER (*Zeitsch. anorg. Chem.*, 1910, 69, 135—157).—The binary system $\text{Li}_2\text{O}-\text{SiO}_2$ forms two compounds, namely, lithium ortho- and meta-silicate, with m. p.'s 1243° and 1188° respectively; they are only slightly miscible in the crystalline state. Lithium metasilicate forms mixed crystals with silica up to 24.3% SiO_2 . The existence of an acid silicate, $\text{Li}_2\text{Si}_2\text{O}_5$, has not been confirmed.

No compound is formed in the binary system $\text{Li}_2\text{SiO}_3-\text{ZnSiO}_3$. Mixed crystals exist from 0 to 7(?)% and 71(?) to 100% of lithium metasilicate. The eutectic temperature is approximately 990° , and the eutectic composition 52(?)% of lithium metasilicate. That portion of the freezing-point curve lying between 10 and 70% Li_2SiO_3 could not be determined thermally, and reliance had to be placed on the optical investigation. Zinc metasilicate has m. p. 1419° .

The system $\text{ZnSiO}_3-\text{CdSiO}_3$ gives an isomorphous series of mixed crystals, the minimum point of the curve being at 25% ZnSiO_3 . The optical investigation did not completely verify the results obtained thermally. Cadmium metasilicate has m. p. 1155° .

In the system $\text{Li}_2\text{SiO}_3-\text{LiBO}_2$, mixed crystals exist from 0 to 24% and 91 to 100% of lithium metasilicate; no compound is formed. The eutectic temperature and composition are respectively 803° and 22% Li_2SiO_3 .

No compound is formed in the system $\text{Na}_2\text{SiO}_3-\text{NaBO}_2$, but mixed crystals exist from 0 to 5% and 96 to 100% of sodium metasilicate. The eutectic temperature and composition are respectively 815° and 55% Na_2SiO_3 . Sodium metasilicate has m. p. 1056° .

Below 1100° sodium tungstate is practically immiscible with sodium metasilicate. The two components are quite immiscible in the crystalline condition. Sodium tungstate has m. p. 700° , and transition temperatures at 589° and 572° .

Throughout this investigation optical methods were more trustworthy than the thermal ones for determining the compositions of the saturated mixed crystals.

T. S. P.

Revision of the Atomic Weights of Silver and Iodine. II. Ratio of Silver to Iodine. GREGORY P. BAXTER (*J. Amer. Chem. Soc.*, 1910, **32**, 1591—1602).—From determinations of the value of the ratio $2\text{Ag}:\text{I}_2\text{O}_5$, Baxter and Tilley (Abstr., 1909, ii, 255) calculated the atomic weights of iodine and silver by the aid of the value 0·849943 for the ratio $\text{Ag}:\text{I}$ (Baxter, Abstr., 1905, ii, 81, 579), and found them to be 126·891 and 107·850 respectively ($O=16$). Richards and Willard (Abstr., 1910, ii, 292), however, have obtained a value of 107·871 for the atomic weight of silver. As it was thought possible that this discrepancy might have been due to an error in the ratio $\text{Ag}:\text{I}$, this ratio has now been re-determined.

Weighed quantities of iodine were reduced to hydriodic acid by means of a solution of hydrazine. The product was diluted, and treated with a slight excess of a very dilute solution of silver nitrate. The clear supernatant liquid was carefully filtered and concentrated by evaporation, and the excess of silver was estimated gravimetrically as silver iodide. Three samples of iodine and several specimens of silver were employed, each of which had been carefully purified. The results of thirteen experiments gave an average value for the ratio $\text{Ag}:\text{I}$ 0·849906, and it is therefore considered probable that the silver iodide obtained in the earlier determinations was contaminated with occluded impurities. On combining this ratio with that of $2\text{Ag}:\text{I}_2\text{O}_5$, the atomic weights of silver and iodine are found to be 107·864 and 126·913 respectively ($O=16$). E. G.

Revision of the Atomic Weight of Calcium. I. Analysis of Calcium Bromide. THEODORE W. RICHARDS and OTTO HÖNSCHMID (*J. Amer. Chem. Soc.*, 1910, **32**, 1577—1590; *Monatsh.*, 1910, **31**, 1203—1226).—Determinations of the atomic weight of calcium by the analysis of the pure chloride (Richards, Abstr., 1902, ii, 394) gave a value of 40·126 ($O=16$; $\text{Cl}=35\cdot455$), which agrees fairly well with that obtained by Hinrichsen (Abstr., 1902, ii, 137). In the present paper, an account is given of a further study of this constant by the analysis of calcium bromide.

The calcium bromide was prepared in the following manner. Calcium nitrate was carefully purified by repeated crystallisation, and was converted into the carbonate by precipitation with ammonium carbonate. The carbonate was dissolved in hydrobromic acid, prepared by the action of hot platinum on a mixture of bromine vapour and hydrogen, and the solution was slightly acidified and afterwards concentrated. The bromide was repeatedly crystallised in quartz vessels, and was dried with special precautions and fused in a platinum boat, first in a current of hydrogen mixed with hydrogen bromide and afterwards in an atmosphere of nitrogen. The salt was then dissolved in water, and, when necessary, the solution was carefully neutralised, the deviations from exact neutrality being estimated by comparison with the pure crystallised salt with the aid of methyl-red. The analysis of the bromide was effected either by determining the amount of silver equivalent to the calcium present or by weighing the precipitated silver bromide. From the results of six experiments in each way, values for the two ratios $\text{CaBr}_2:2\text{Ag}$ and $\text{CaBr}_2:2\text{AgBr}$

were obtained, which gave essentially the same value for the atomic weight, 40.070 ($\text{Ag} = 107.88$) or 40.066 ($\text{Ag} = 107.87$). Two different specimens of the salt gave almost identical results.

The density of fused calcium bromide was found to be 3.353 at 25°.
E. G.

Electro-deposition of Lead from Perchlorate Solutions.
FRANK C. MATHERS (*Chem. Zeit.*, 1910, 24, 1316—1318, 1350—1351; *Trans. Amer. Elektrochem. Soc.*, 1910, 17, 261—272).—Experiments with the lead perchlorate plating and refining bath are described. The properties of lead perchlorate which are of special value in plating or refining solutions are: (1) Great solubility. (2) Cathode deposits, which are smooth, dense, and free from "trees." (3) Approximately theoretical corrosion of the anode and deposition upon the cathode. (4) Absolute stability under all conditions to which it is subjected in a plating or refining bath. (5) No polarisation from the formation of lead peroxide on the anode. (6) Very high electrical conductivity.

The bath should contain about 5% of lead, 2—5% of free perchloric acid, and 0.25% of peptone. A current density of from 2—3 amperes per sq. dm. (18—27 amperes per sq. ft.) may be used. The peptone is gradually used up, and after about four days a quantity equal to the original amount should be added. The free acid, which is very slowly neutralised by the chemical solution of the lead, must be restored by treatment of a suitable portion of the solution with the right amount of sulphuric acid, thus precipitating lead sulphate and leaving perchloric acid in solution. The filtrate is returned to the bath.

The bath gives excellent purification, the cathode being about 93.98% pure, and shows no deterioration with use, giving as good deposits after two months as at the beginning, if the concentration, acidity, and the required amount of peptone are maintained. Chlorides and barium salts must be absent. A bath that has been giving good deposits will form very bad "trees" if a quantity of hydrochloric acid or some barium perchlorate is added to it.

T. S. P.

Red Lead. IV. JAROSLAV MILBAUER (*Chem. Zeit.*, 1910, 24, 1341—1342. Compare *Abstr.*, 1910, ii, 294).—The oxidation of litharge to red lead in air at 460° follows a course similar to that already observed in the case of lead. Litharge obtained in the manufacture of nitrites is much better for this purpose than ordinary litharge; at 500° the former gave the same percentage of red lead after one hour as the latter after fifteen hours at 460°. Thus, although 460° is the optimum temperature for the formation of red lead, the increased velocity attained at 500° gives better results.

The rate at which red lead is formed is conditioned more by the origin or by the kind of lead oxide used than by the size of the particles. The percentage of red lead obtained depends on the partial pressure of the oxygen in the gas used, but even with pure oxygen at 450° it has hitherto been impossible to obtain 100% red lead.

T. S. P.

Studies in Vapour Pressure: VI. Quantitative Study of the Constitution of Calomel Vapour. ALEXANDER SMITH and ALAN W. C. MENZIES (*Proc. Roy. Soc. Edin.*, 1910, 31, 183–185; *J. Amer. Chem. Soc.*, 1910, 32, 1541–1555).—A review is given of previous work on the constitution of mercurous chloride vapour, and it is shown that there are no experimental data in existence from which the proportion of dissociated ($Hg + HgCl_2$) to non-dissociated molecules ($HgCl$) in the vapour can be deduced. An investigation has now been made, based on the principle of partial vapour pressures.

Determinations have been made of the vapour pressures of mercury, mercurous chloride, and a mixture of these substances, between 360° and 400°, by means of the static isoteniscope (Abstr., 1910, ii, 1036, 1037). The results show that mercurous chloride vapour, even when saturated, is completely dissociated into Hg and $HgCl_2$, and that molecules of the formula $HgCl$ or Hg_2Cl_2 are not present. The b. p. of mercurous chloride is 382.5°, and its molecular weight, when dissolved in mercury, corresponds with the formula $HgCl$. E. G.

Double Nitrates of the Rare Earths. I. Double Nitrates of the Rare Earths with the Alkali Metals. GUSTAV JANTSCH and S. WIGDOROW (*Zeitsch. anorg. Chem.*, 1911, 69, 221–231).—To prepare the double nitrates of the rare earths with the alkali metals, the procedure generally adopted was to dissolve the oxide of the rare earth, together with the necessary quantity of the nitrate of the alkali metal, in concentrated nitric acid and evaporate until crystals formed.

Wyruboff's statements (Abstr., 1908, ii, 385) as to the hydration of the crystals of the double nitrates of sodium, potassium, and caesium with lanthanum and cerium are not confirmed. The formulae of the various compounds are written so as to indicate that the rare earths are tervalent in their stable forms of combination.

Lanthanum sodium nitrate, $[La(NO_3)_3]Na_2H_2O$, forms slender, white needles; $D_4^o = 2.63$, and molecular volume = 195.08; it is not completely dehydrated at 150°. Lanthanum potassium nitrate,

$[La(NO_3)_3]K_22H_2O$, has $D_4^o = 2.54$, and molecular volume = 221.76; hygroscopic, white shining crystals, which lose $2H_2O$ at 60°. Acid lanthanum rubidium nitrate, $[La(NO_3)_3]Rb_2HNO_3 \cdot 6H_2O$, obtained when lanthanum and rubidium nitrates are taken in the molecular proportion of 1 : 2; forms colourless plates, which lose $5H_2O$ and $1HNO_3$ at 120°; the resulting $[La(NO_3)_4]Rb_2H_2O$ is not dehydrated at 200°; $D_4^o = 2.377$, and molecular volume = 270.6.

When lanthanum and rubidium nitrates are taken in the molecular proportion of 1 : 4, lanthanum rubidium nitrate,

$[La(NO_3)_5]Rb_24H_2O$, results; monoclinic crystals, m. p. 86°; $D_4^o = 2.497$, and molecular volume = 277.1; it loses $4H_2O$ on prolonged heating at 60°. Lanthanum caesium nitrate, $[La(NO_3)_5]Cs_22H_2O$, forms small, tabular crystals, $D_4^o = 2.827$, and molecular volume = 265.5. Lanthanum thallic nitrate, $[La(NO_3)_5]Tl_24H_2O$, forms hygroscopic crystals, m. p. 72°; $D_4^o = 3.318$ and molecular volume = 280.0; it loses $4H_2O$ at 100°. Cerous sodium

nitrate, $[\text{Ce}(\text{NO}_3)_5]\text{Na}_2\text{H}_2\text{O}$, consists of hygroscopic, slender needles, which are not completely dehydrated at 150° ; $D_4^o = 2.65$, and molecular volume = 194.0. Cerous rubidium nitrate, $[\text{Ce}(\text{NO}_3)_5]\text{Rb}_2\text{H}_2\text{O}$, has $D_4^o = 2.497$, and molecular volume = 277.6; hygroscopic, monoclinic needles, m. p. 70° , which lose $4\text{H}_2\text{O}$ at 60° . Cerous thallous nitrate, $[\text{Ce}(\text{NO}_3)_5]\text{Th}_2\text{H}_2\text{O}$, forms hygroscopic crystals, m. p. 64.5° ; $D_4^o = 3.326$, and molecular volume = 279.7; it loses $4\text{H}_2\text{O}$ at 60° .

Praseodymium rubidium nitrate, $[\text{Pr}(\text{NO}_3)_3]\text{Rb}_2\text{H}_2\text{O}$, green, hygroscopic, monoclinic crystals, m. p. 63.5° ; $D_4^o = 2.50$, and molecular volume = 277.4; it loses $4\text{H}_2\text{O}$ at 60° . *Neodymium rubidium nitrate*, $[\text{Nd}(\text{NO}_3)_3]\text{Rb}_2\text{H}_2\text{O}$, consists of hygroscopic, bright reddish-violet plates, m. p. 47° ; $D_4^o = 2.56$, and molecular volume = 272.3; it loses $4\text{H}_2\text{O}$ at 60° .

The temperature at which the above compounds melt in their water of crystallisation falls with increasing atomic weight of the rare-earth metal.

T. S. P.

A New Element Accompanying Lutecium and Scandium in Gadolinite Earths: Cetium. GEORGES URBAIN (*Compt. rend.*, 1911, 152, 141—143. Compare Abstr., 1907, ii, 956; 1908, ii, 233; 1909, ii, 735).—During repeated fractionation of the nitrates in the isolation of lutecium from gadolinite earths, a few drops of a mother liquor were obtained which did not crystallise. This contained a new oxide belonging to the rare earths and characterised by a magnetic susceptibility three or four times less than that of lutecia. The name cetium is given to the corresponding element, and the symbol Ct assigned to it.

Spectroscopic examination of the oxide showed the presence of lutecium, scandium, a trace of neoytterbium, and negligible traces of calcium and magnesium. The new element shows a large number of lines in the arc; the following are very intense: $\lambda = 2685.2$, 2765.8, 3080.7, 3118.6, 3197.9. The chloride is somewhat more volatile than that of lutecium, but less volatile than scandium chloride. The hydroxide is less basic than lutecium oxide and more basic than scandium oxide.

Cetium either appears to be entirely absent from xenotime, or else it occurs in very faint traces.

W. O. W.

Electrical Properties of Aluminium-magnesium Alloys. WITOLD BRONIEWSKI (*Compt. rend.*, 1911, 152, 85—87. Compare Abstr., 1910, ii, 128; Grube, Abstr., 1905, ii, 523).—From an examination of aluminium-magnesium alloys by the electrical method already described, the author comes to the conclusion that two definite compounds, AlMg and Al_2Mg_3 , probably exist. These form a continuous series of solid solutions with one another, preventing their recognition by the thermal method. The existence of the compounds Al_1Mg and AlMg_2 could not be confirmed, and alloys of the metals in these proportions showed a heterogeneous structure under the microscope.

W. O. W.

Formulae of Aluminium Salts. GERRIT H. COOPS (*Chem. Weekblad*, 1910, 7, 1071—1076). Compare Coops, Abstr., 1910, ii, 506; and Olivier, *ibid.*, 507).—Polemical. A reply to Olivier.

A. J. W.

Colloidal Solubility of Metals in Distilled Water in Presence of Air and in a Vacuum. MARGHERITA TRAUBE-MENGARINI and ALBERTO SCALA (*Atti R. Accad. Lincei*, 1910, [v], 19, ii, 505—508). Compare Abstr., 1909, ii, 809).—Distilled water acts on aluminium in the warm and in the presence of air, and zinc and iron are attacked in the cold, colloidal solutions being formed in each case. Lead and iron, which alone were experimented with, yield colloidal solutions when treated with distilled water in a vacuum. The clear solutions become turbid in air, that of iron turning a greenish and finally a reddish colour, whilst the red solution becomes milky. The colloidal iron solution when kept in a vacuum forms black, green, and red deposits. Of these, the red and black ones are permanent in air, but the green deposit becomes red even in a vacuum. The bacteriform colloidal corpuscles of all these metals change (without passing into true solution) into the leaf-like crystals characteristic of colloidal solutions.

R. V. S.

Solid Solutions of Iron and Manganese Borides. JOSEPH HOFFMANN (*Chem. Zeit.*, 1910, 34, 1349—1350).—The heterogeneous nature of the borides prepared by the thormite process has already been shown by optical methods (Abstr., 1910, ii, 508), and is confirmed by the chemical behaviour of the various products. The composition of the saturated solutions obtained is 7 atoms of iron to 9 of boron for the iron boride, and 10 atoms of manganese to 28 atoms of boron, for the manganese boride. Mineral acids extract compounds, such as Fe_5B_6 , Fe_2B_4 , and FeB , from the iron boride, leaving a residue consisting mainly of Fe_2B_3 with a little FeB_2 . The soluble portions of manganese boride consist chiefly of MnB , together with some MnB_2 , the undissolved residue being elementary boron mixed with some higher borides.

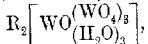
T. S. P.

Iso- and Hetero-poly-acids. I. Metatungstic Acid. ARTHUR ROSENHEIM and FRANZ KOHN (*Zeitsch. anorg. Chem.*, 1911, 62, 247—260). Compare this vol., i, 109).—The authors distinguish between “isopoly-acids” and “hetero-poly-acids.” The former are compounds containing the acid anhydride and the acid hydrate of one and the same element, for example, the polychromates, polytungstates, etc., whilst the latter are compounds in which acid anhydrides of one or more elements are combined with a hydrate or salt of the acid of another element, for example, the phosphomolybdates, etc., which have hitherto been called complex acids.

According to Copaux’s views of the constitution of the metatungstates, boro- and silico-tungstates (Abstr., 1909, ii, 318), the metatungstates must contain water of constitution, so that they should belong to the hetero- and not to the iso-poly-acids. It is desired to find out how much water of constitution is contained in the met-

tungstates, the authors have prepared, by double decomposition, various insoluble salts, since these generally do not contain water of crystallisation. *Silver metatungstate*, $\text{Ag}_2\text{W}_4\text{O}_{13}\cdot 3\text{H}_2\text{O}$, forms small, white crystals, which lose $1\cdot 1\text{H}_2\text{O}$ at 160° and $1\cdot 3\text{H}_2\text{O}$ at 200° ; 2 molecules of water, and probably 3, are therefore firmly combined. In *thallium metatungstate*, $\text{Tl}_2\text{W}_4\text{O}_{13}\cdot 3\text{H}_2\text{O}$, only 1 molecule of water is firmly combined. *Guanidine metatungstate*, $(\text{CH}_3\text{N}_3)_2\text{H}_2\text{W}_4\text{O}_{13}\cdot 3\text{H}_2\text{O}$, was obtained from guanidine carbonate and metatungstic acid as a white, microcrystalline powder. Between 90° and 150° it loses $2\text{H}_2\text{O}$, so that probably only 1 molecule of water is firmly combined. The normal lead and mercury metatungstates, although frequently mentioned in the literature, could not be obtained. A solution of an alkali metatungstate gives with lead nitrate a precipitate of the double salt, $\text{PbW}_4\text{O}_{13}\cdot \text{Pb}(\text{NO}_3)_2\cdot 10\text{H}_2\text{O}$, which loses $7\text{H}_2\text{O}$ at 110° , so that 3 molecules of water are firmly combined.

From the above results, combined with Friedheim's statement (Inaug. Dissert.), that the metatungstates of sodium, barium, manganese, and cadmium still contain $3\text{H}_2\text{O}$ at 100° , and especially since insoluble salts are generally anhydrous, the authors draw the conclusion that the metatungstates contain 3 molecules of water of constitution, that is, they are aquo-salts, and must probably be formulated as



although they may be $\text{R}_2\left[\text{WO}^{(\text{WO}_4)_3}_{(\text{H}_2\text{O})_3}\right]$. When heated at such a temperature that water of constitution is lost, they are decomposed.

Metatungstic acid was prepared by treating a concentrated aqueous solution of ammonium metatungstate with ether and concentrated hydrochloric (or sulphuric) acid. Of the three layers formed, the lower yellow one contains the free acid together with ether and the mineral acid, from which the free metatungstic acid is obtained by evaporation in a current of air. It readily effloresces; crystals were obtained corresponding with $\text{H}_3\text{W}_4\text{O}_{13}\cdot 8\text{H}_2\text{O}$ and $\text{H}_2\text{W}_4\text{O}_{13}\cdot 6\text{H}_2\text{O}$. It is quite insoluble in ether (compare Abstr., 1896, ii, 477), although in the presence of a mineral acid it is possible that a molecular compound of metatungstic acid and ether is formed. In aqueous solution it behaves as a normal electrolyte, and conductivity measurements after the addition of varying quantities of sodium hydroxide show it to be a dibasic acid. In absolute alcoholic solution it acts as a colloid.

Esters of metatungstic acid could not be obtained.

The above results cannot be brought into accordance with Copaux' formulation of metatungstic acid as $\text{H}_{12}\text{W}_{24}\text{O}_{78}\cdot 3\text{H}_2\text{O} + \text{aq}$. T. S. P.

¹ Atomic Weight of Vanadium. D. J. McADAM, jun. (*J. Amer. Chem. Soc.*, 1910, **32**, 1603—1615).—The values previously obtained for the atomic weight of vanadium show considerable discrepancy, and a re-determination has therefore been made by a new method. This method is based on the observation of Smith and Hibbs (Abstr., 1894, ii, 455) that vanadium can be completely removed from sodium metavanadate by volatilisation in a current of dry hydrogen chloride.

Five samples of sodium metavanadate were used in the experiments. The apparatus employed is described with the aid of a diagram. A weighed quantity of the anhydrous salt was placed in a weighed quartz flask, and was heated in a current of hydrogen chloride containing a little chlorine. When as much as possible of the vanadium had been removed, a little water was introduced into the flask, and the mixture was again heated in the current of hydrogen chloride. The whole of the vanadium was thus expelled, and a residue of sodium chloride obtained. The flask and residue were weighed, and the weight of the sodium chloride obtained by subtracting that of the flask.

The results of five experiments gave an average value for the atomic weight of vanadium, 50.967 ± 0.006 ($\text{Na} = 23.00$; $\text{Cl} = 35.46$). This value agrees with that obtained by Prandtl and Bleyer (Abstr., 1910, ii, 135) by the analysis of vanadium oxychloride.

Anhydrous sodium metavanadate has D 2.79.

E. G.

Bismuth. LUDWIG VANINO and EMILIE ZUMBUSCH (Arch. Pharm., 1910, 248, 665—669).—Trials with the various methods described for the preparation of bismuth hydroxide showed that it was difficult to prepare a product free from nitrate. Good results were obtained with Thibault's process (Abstr., 1901, ii, 106), but only when a very large excess of potassium hydroxide was employed. A satisfactory preparation was obtained eventually by dissolving bismuth nitrate (20 grams) in water (100 c.c.) containing mannitol (7.5 grams), adding 50 c.c. of ice-cold potassium hydroxide solution (22 grams in 100 c.c. of water), and finally dilute sulphuric acid until the mixture was only slightly alkaline (compare Abstr., 1902, i, 8).

Previous work by Vanino and Treubert (Abstr., 1898, ii, 435, 508; 1899, ii, 428; compare Herz and Guttmann, Abstr., 1907, ii, 274) has shown that bismuth suboxide probably does not exist, but the authors have made experiments with the process described by Jaworososki for the preparation of this substance (Pharm. Zeit. Russ., 1896). This method consists in warming a mixture of ferrous sulphate, sodium potassium tartrate, and sodium hydroxide in water with basic bismuth nitrate. The brownish-black precipitate so obtained in the author's experience was never free from iron even when the reacting ingredients were used in calculated proportions for the production of the suboxide, so that they do not regard Jaworososki's preparation as a definite substance. T. A. H.

Brown Gold. MAURICE HANRIOT (Compt. rend., 1910, 151, 1355—1357).—This name is given to the residue obtained when nitric acid is allowed to act on an alloy of gold and silver containing about 20% of gold. It always contains a small quantity of silver and a considerable amount of nitric acid. The latter is lost at 175—200°; on further heating it changes colour and undergoes contraction; at 900° the substance evolves gas, and at 1040° it melts, changing into red gold.

The author has measured the contraction undergone by strips of alloy containing 1—3.5% of silver on treatment with nitric acid, and

also the further contraction that ensues on heating. Results are also quoted showing the further contraction that occurs on a second and third heating.

W. O. W.

Mineralogical Chemistry.

Mineral Oils from Potash-Salt Deposits. EDMUND GRAEFE (*Centr. Min.*, 1911, 1—4).—Two oils differing widely in their characters are compared. I. is from the potash-salt works "Desdemona" at Alfeld, on the Leine, and II, from the salt works "Glückauf" at Sondershausen.

	I.	II.
Colour, &c.	{ Yellow, transparent ; thin liquid.	Dark brown ; viscous.
Sp. gr.	0·892	0·935
Ignition point	16°	over 100°
Bulding point	115°	300°
Distillate up to 300°	54%	--
Sulphur	0·034%	0·35%
Iodine number	1·54	11·47
Paraffin	9·36%	4·30%
M. p. of paraffin	54·4°	56·2°
Heat of combustion	10,883	10,534
Asphalt	0%	35·5%

Suggestions are offered to explain as to how oils with these different characters may have originated.

L. J. S.

Composition of Fahlerz. A. KRETSCHMER (*Zeitsch. Kryst. Min.*, 1910, 48, 484—513).—A historical review is given of the different formulæ that have at various times been proposed for fahlerz (tetrahedrite and tennantite), and one hundred and sixty-two published analyses are tabulated. Fifteen new analysis are given. Details of the method of analysis are given; the material was decomposed in bromine vapour in a current of carbon dioxide. The material analysed in some cases was massive, and not of ideal purity (and in others the fact that the fracture was uneven, rather than conchoidal, indicates that the material was not homogeneous).

I. Crystals from Horhausen, Rhenish Prussia. II. Massive from Hornachuelos, Cordoba, Spain. III. Massive from Huanchaca, Bolivia. IV. Crystals from Schemnitz, Hungary. V. Crystals from Aurora mine, Dillenburg, Nassau. VI. Crystals from Kapnik, Hungary. VII. Crystals from Botés, Transylvania. VIII. Massive from Schwaben mine, Müsen, Westphalia. IX. Massive from Kotterbach, Zips, Hungary. X. Crystals from Gross-Kogel, Brixlegg, Tyrol. XI. Massive from Mouzaia, Algeria. XII. Crystals from San Lorenzo mine, Santiago, Chile. XIII. Crystals from Guanajuato, Mexico. XIV. Crystallised ("julianite") from Friederike Juliane mine, Kupferberg, Silesia. XV. Crystals (tennantite), mixed with erubescite, from Cook's Kitchen mine, Redruth, Cornwall.

	Cu.	Ag.	Zn.	Fe.	Pb.	Sb.	As.	S.	Total.	Sp. gr.
I.	37.75	0.11	6.51	1.10	0.71	28.66	—	24.61	99.9888	5.073
II.	38.95	0.02	2.21	4.77	—	27.00	1.40	25.66	100.01	4.959
III.	29.99	12.74	2.49	3.29	0.25	26.42	0.58	23.71	99.47	4.769
IV.	37.93	0.45	7.57	0.60	—	26.12	1.84	25.21	99.72	4.789
V.	38.52	0.08	7.05	0.94	—	25.26	2.69	25.22	99.78	4.736
VI.	38.59	0.68	6.16	1.05	—	24.98	2.25	25.85	99.20*	4.791
VII.	36.10	1.51	6.44	0.73	2.72	24.00	2.75	24.99	100.13†	4.870
VIII.	33.30	1.70	5.32	2.66	0.83	23.44	4.48	23.83	99.068	4.779
IX.	40.57	0.03	1.61	4.53	—	20.60	5.07	25.21	99.82‡	4.651
X.	40.91	0.23	4.85	2.57	—	15.77	9.03	26.34	100.50†	4.738
XI.	42.35	0.09	1.48	4.31	—	14.51	10.24	26.38	99.36	4.740
XII.	42.05	0.04	6.99	1.48	—	10.87	12.57	27.12	100.22	4.867
XIII.	42.15	1.31	2.62	5.44	—	4.66	16.68	27.61	100.47	4.576
XIV.	48.50	0.23	—	2.77	—	2.44	18.82	27.04	100.24**	4.662
XV.	53.24	—	0.23	1.58	—	—	18.29	26.64	100.11††	4.746

* Including Bi, 0.53; * Including SiO_2 , 0.14; + Including Mn, 0.26; SiO_2 , 0.32; § Including Ni, 2.49; Hg, 0.75; SiO_2 , 0.26: the nickel is present in an admixed nickel mineral. † Including Hg, 1.32; BaSO₄, 0.73; || Including Hg, 0.80. ** Including insoluble, 0.44. ‡ Including insoluble, 0.23.

The formula deduced from these analyses is $(\text{R}'_x \text{R}''_y)_3 \text{R}'_z \text{S}_{3-x-y}$, where R = Cu, Ag; R'' = Zn, Fe, etc.; R''' = Sb, As, Bi; x+y+z=3. This is identical with the formula proposed by Prior and Spencer, $3\text{R}_2(\text{S}, \text{R}'_z \text{S}_3) + z(6\text{R}'_z \text{S}, \text{R}'_z \text{S}_3)$ (Abstr., 1900, ii, 21). In the latter formula, $\text{R}'_z \text{S}_3$ and $\text{R}'''_z \text{S}_3$ are regarded as isomorphously replaceable, whilst the present author regards $\text{R}'_z \text{R}''_z$ and $\text{R}'''_z \text{R}''_z$ as equivalent.

L. J. S.

Braunite from Minas Geraës, Brazil. B. JEŽEK (*Zeitsch. Kryst. Min.*, 1910, 48, 543—544; from *Rozpravy bohem. Akad.*, 1908, 13, II, Kl., No. 7).—A crystallographic description is given of small, brilliant crystals. The finely granular matrix of these crystals proved on analysis to be also braunite:

MnO.	O.	Fe ₂ O ₃	BaO.	SiO ₂ .	H ₂ O.	Total.	Sp. gr.
83.76	8.20	1.18	0.98	3.93	0.50	98.55	4.69—4.72

L. J. S.

Chromite from the Marjalahti Meteorite: Analcite from Brödtorp. LEONARD H. BORGSTRÖM (*Zeitsch. Kryst. Min.*, 1910, 48, 540—541; from *Geol. För. Stockholm Förh.*, 1908, 30, 331—337).—On the olivine and in contact with the nickel-iron of the Marjalahti meteorite (Abstr., 1905, ii, 537) are small crystals of chromite, some of which are rich in faces. Analysis gave:

Cr ₂ O ₃ .	Al ₂ O ₃ .	FeO.	MgO.	NiO.	Total.	Sp. gr.
65.63	3.78	25.84	4.27	0.73	100.25	4.93

Analcite occurs as crystals in cavities in granulite at Brödtorp. Analysis gave:

SiO ₂ .	Al ₂ O ₃ .	Fe ₂ O ₃ .	Na ₂ O.	K ₂ O.	H ₂ O.	Sp. gr.
54	22	trace	12	trace	8	2.241—2.246

L. J. S.

Calcium Carbonate. JÓZEF MOROZEWICZ (*Zeitsch. Kryst. Min.*, 1910, 48, 522—523; from *Kosmos*, Lemberg, 1907, 32, 487—495).—The name *lublinite* is applied to a variety of calcium carbonate occurring as felt-like masses in crevices in chalk-marl at Wysokie, govt. Lublin, Russian Poland. Analysis gave: CaO, 55·13; CO₂, 43·06; insol., 1·04; loss on ignition, 0·95. Under the microscope, the fibres are strongly birefringent with oblique extinction; they are, therefore, crystals of calcite greatly elongated in the direction of an edge of the primary rhombohedron.

Small crystals of aragonite, prepared artificially by precipitation with ammonium carbonate, were heated for several hours at a low red-heat; they thereby became transformed into calcite. When heated to bright redness, the crystals were converted into lime, although still preserving their external form. These isotropic crystal skeletons when moistened with ammonium carbonate solution are converted into calcite. The carbon dioxide can thus be removed and again replaced without destroying the external form of the crystals. L. J. S.

Natramblygonite, a New Mineral. WALDEMAR T. SCHALLER (*Amer. J. Sci.*, 1911, [iv], 31, 48—50).—This was found in association with tourmaline, lepidolite, and albite in a pegmatite mass near Canon City, Colorado. It is a massive, cleavable, greyish-white mineral resembling amblygonite in appearance, from which it differs in containing sodium in place of lithium, being in fact a soda-amblygonite. The formula, (Na, Li)Al(OH, F)PO₄, is analogous to that of amblygonite. Analysis gave:

							Total.	
TiO ₃	Al ₂ O ₃	Li ₂ O	Na ₂ O	K ₂ O	H ₂ O	F	(less O for F)	Sp. gr.

44·35 33·59 3·21 11·23 0·14 4·78 5·63 100·56 3·04

L. J. S.

Terminology of Alumosilicates. JÓZEF MOROZEWICZ (*Zeit. Kryst. Min.*, 1910, 48, 523—524; from *Kosmos*, Lemberg, 1907, 32, 496—499).—The decomposition of alumosilicates gives rise to alumosilicic acids, there being a greater affinity between silicon and aluminium than between aluminium and the metals of the alkalis and alkaline earths. Lemberg and Thugutt have obtained the well crystallised compound 4(Na₂Al₂Si₂O₈)₅H₂O by acting on kaolin (H₂Al₂Si₂O₈H₂O) with a 15% solution of sodium hydroxide. Kaolin is thus an alumosilicic acid of the following series with the general formula H₂Al₂Si_nO_{8+n+4}.

H₂Al₂Si₂O₈: alumodisilicic acid: kaolin (without water of crystallisation); in sodalite, nosean, etc.

H₂Al₂Si₃O₁₀: alumotrisilicic acid: cimolite (without water of crystallisation); in natrolite.

H₂Al₂Si₄O₁₂: alumotetrasilicic acid: pyrophyllite; leucite is the potassium salt, K₂Al₂Si₄O₁₂.

H₂Al₂Si₅O₁₄: alumopentasilicic acid: in harmotone.

H₂Al₂Si₆O₁₆: alumohexasilicic acid: in albite, which is thus sodium alumohexasilicate, Na₂Al₂Si₆O₁₆. L. J. S.

Solid Solution in Minerals, with Special Reference to Nephelite. HARRY W. FOOTE and W. M. BRADLEY (*Amer. J. Sci.*, 1911, [iv], 31, 25—32).—Even allowing for the presence of mechanically admixed impurities and isomorphous replacements, there are certain minerals for which a satisfactory and simple formula cannot be deduced. It is suggested that in such cases some other constituent may be present in the state of solid solution in the mineral, in much the same way as salt is dissolved in water, or as homogeneous crystals of ammonium chloride may contain ferric chloride (Roozeboom, 1892). Here we have homogeneous mixtures of different compounds (not of the same type, as in isomorphous mixtures) which cannot be separated by mechanical means; and between certain limits the composition of such mixtures may vary continuously.

This principle is held to apply in the case of nephelite, the formula of which approximates to, but never in the natural mineral quite agrees with, the simple formula NaAlSiO_4 . This formula corresponds with those of the isomorphous minerals eucryptite, LiAlSiO_4 , and kalophilite, KAlSiO_4 ; and the artificial nephelites prepared by Doelter, in 1884, vary from NaAlSiO_4 to compounds containing potash and an excess of silica.

The following is the mean of four analyses made of carefully purified nephelite from Eikaholmen, Norway; the material contained a trace of intimately admixed albite (insoluble in hydrochloric acid), but under the microscope it appeared to be homogeneous.

SiO_2 .	Al_2O_3 .	Fe_2O_3 .	K_2O .	Na_2O .	H_2O .	Total.	Sp. gr.
44·46	33·11	0·96	5·61	16·22	0·38	100·84	2·635.

The molecular ratios are $\text{SiO}_2 : \text{Al}_2\text{O}_3$, etc.: Na_2O , etc. = 2·23:1·00:0·98. In the nephelite analyses by Morozewicz (*Abstr.*, 1908, ii, 201), $\text{Al}_2\text{O}_3 : \text{Na}_2\text{O}$ also = 1:1, whilst the ratio of $\text{SiO}_2 : \text{Al}_2\text{O}_3$ varies from 2·11 to 2·21, and the same relations hold with other published analyses. It is, therefore, assumed that the excess of silica over that required by the formula NaAlSiO_4 is present in solid solution in the sodium aluminium silicate. The "saturation ratio" of the silica is 2·21, since, when more silica is present, this has separated as albite ($\text{NaAlSi}_3\text{O}_8$), which occurs intimately intermixed with the nephelite.

L. J. S.

Chemical Distinction between Orthoclase and Microcline. VLADIMIR I. VERNADSKY and Mlle. E. RÉVOUTSKY (*Compt. rend.*, 1910, 151, 1372—1374. Compare Barbier, *Abstr.*, 1908, ii, 704).—Barbier has indicated as a general chemical distinction between orthoclase and microcline the existence of traces of lithium and rubidium in the former, and their absence from the latter. This being contrary to observations of one of the authors (*Bull. Acad. Sci. St. Petersburg*, 1909, 114, 822), five new specimens of microcline from Russia, Colorado, Norway, and Finland have been examined spectroscopically, with the result that either lithium or rubidium or both were found to be present in each specimen.

W. O. W.

Remarkable Garnet from Fluminimaggiore [Sardinia]. AURELIO SERRA (*Rend. Accad. Sci. Fis. Mat. Napoli*, 1910, [iii], 16, 222—224).—The garnet was found in association with galena. It has the following composition :

SiO_3	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	Total.
34·53	6·05	25·10	0·84	trace	33·67	100·19

which indicates that it is andradite, in which the silicate $\text{Ca}_3\text{Fe}_2(\text{SiO}_4)_3$ is associated with $\text{Ca}_3\text{Al}_2(\text{SiO}_4)_3$. The colour of the mineral is honey-yellow, and in this and other respects it is similar to a garnet from Sala, in Isvezia (also found in association with galena), which was analysed by Bredberg.

R. V. S..

Chemical Composition of the Gases Evolved from the Thermal Spring at Uriage (Isère). GUSTAVE MASSOL (*Compt. rend.*, 1910, 151, 1124—1126. Compare Abstr., 1908, ii, 1004; Besson, *ibid.*, ii, 1005).—The spring at Uriage evolves a mixture of gases composed of nitrogen, 93·98%, carbon dioxide, 4·15%, rare gases, 1·87%, with traces of oxygen. The rare gases were passed over wood charcoal at the temperature of liquid oxygen, when about half the volume, consisting of argon, krypton and xenon, was absorbed. The remaining gas contained neon and helium, the latter constituting 0·932% of the original mixture. The spring probably emits not less than twenty litres of helium daily, and is one of the most considerable sources of this element hitherto discovered.

W. O. W.

Ratio of the Cl^- , SO_4^- , and σ_0 -Values of a Series of Sea-water Samples Examined in the Hydrographical Laboratories of Helsingfors, Kiel, Christiania, Monaco, and Nancy. ERNST RUPPIN (*Zeitsch. anorg. Chem.*, 1911, 69, 232—246).—Analyses of sea-waters collected at different depths show that there is a fairly definite connexion between density, salt content, and percentages of SO_4^- and Cl^- , although this has been disputed. A recalculation of Dittmar's results (*Reports of Voyage of H.M.S. Challenger*, 1873—76; Physics and Chemistry, Vol. I) shows that the salt content of the sea-waters examined can be determined from a knowledge of the chlorine content.

T. S. P.

Physiological Chemistry.

Action of Asphyxia on the Spinal Animal. G. C. MATHISON (*J. Physiol.*, 1910, 41, 416—449).—Lack of oxygen is the main factor in asphyxia in the spinal animal, but the spinal vaso-motor centres are much less sensitive to various agencies than the medullary centres. Excess of carbon dioxide and injection of acids act on the spinal cord much in the same way as lack of oxygen.

W. D. H.

Physiological Climatology. I. Relation of Loss of Water from the Skin and Lungs to the External Temperature in Actual Climatic Conditions. WILLIAM A. OSBORNE (*J. Physiol.*, 1910, 41, 345—354).—The usual statement that heat loss by radiation and conduction makes up the greater portion of the total heat loss is only true under certain conditions; an air temperature equal to that of the body would reduce this loss to zero. If the metabolism of the body is constant during rest and the heat production fairly constant, it follows that if the air temperature is raised, and loss by radiation and conduction lessened, the heat loss due to evaporation must make up the balance, otherwise heat accumulation would occur. It would be expected therefore that the water loss would be a linear function of the air temperature. The linear relationship is, however, more perturbed; the cause is not clothing, but is more complex; one factor is the varying humidity and velocity of the air. If the air is dry and in movement it will tend to desiccate the skin, but if body temperature and skin imbibition are to be kept constant, then the metabolism must be augmented. What apparently occurs is a compromise; the skin loses some of its water of imbibition, and the metabolism undergoes a moderate rise. Hence the unpopularity of the East wind in N.W. Europe.

The lung ventilation is increased when the air temperature is high; this is a familiar fact with the lower animals. How the respiratory centre is affected by a high air temperature is a puzzle, for the body temperature does not rise; possibly the carotid blood may become heated in its passage up the neck.

It is also found that the carbon dioxide excreted varies directly, not inversely, as the external temperature; the increase in pulmonary ventilation will in part explain this; more carbon dioxide is produced from the additional work of the respiratory muscles, and more "washed out" from the tissues.

There is some indication that the respiratory quotient rises with rising shade temperature. Harvey Sutton found that this quotient approached unity when the wet bulb-temperature rose in a room which he could artificially make warm and moist, and made some suggestions regarding the relation of this reaction to the preponderance of carbohydrates in the diets of tropical aborigines. W. D. H.

Influence of Lactic Acid on the Dissociation Curve of Blood. JOSEPH BARCROFT and L. ORBELI (*J. Physiol.*, 1910, 41, 355—367).—Lactic acid is a valuable accessory to carbon dioxide in tissue respiration; both tend to turn out the oxygen from the blood. The method of determining the tensions of the blood-gases is by a new tonometer, which is figured and described in detail; for this and for the discussion of certain difficulties which arise, the original paper must be consulted. W. D. H.

The Action of Choline on Blood-pressure. LEO POPIELSKI (*Ztsch. physiol. Chem.*, 1910, 70, 250—252).—The author reiterates the view expressed previously by Modrakowski and himself that

choline produces a rise of arterial pressure, and that the opposite result obtained by others is due to their having used impure material.

W. D. H.

The Effect of Potassium Salts on the Circulation, with Special Reference to the Production of Heart-Block. G. C. MATHISON (*Proc. physiol. Soc.*, 1910, xix—xx; *J. Physiol.*, 41).—Potassium salts cause vaso-constriction when both brain and spinal cord are destroyed; they therefore act directly on the vessel walls. On the heart, large doses produce diastolic stoppage, but in some cases smaller doses produce heart-block, from which recovery occurs.

W. D. H.

The Influence of the Blood-corpuscule Lipoids on the Blood Formation. L. KEPINOW (*Biochem. Zeitsch.*, 1910, 30, 160—172).—The author shows that by the injection of blood-lipoids from ox-blood into rabbits rendered anaemic by bleeding, the rate of formation of new blood corpuscles is increased. The regeneration took about half the time to that required by control animals which had received no lipid injection. The same result was not achieved by ovolecithin.

S. B. S.

Blood Sugar. VIII. The Sugar Content of the Corpuscles. PETER RONA and DENGU TAKAHASHI (*Biochem. Zeitsch.*, 1910, 30, 99—106).—The authors confirm the observations of others as to the probable presence of dextrose in the corpuscles. The proteins were precipitated by the Michaelis-Rona dialysed iron method, sodium dihydrogen phosphate being the salt employed for precipitating the colloid, and the reducing power and polarisation were estimated in the filtrate before and after fermentation by yeast. In the latter case, the reducing power almost completely disappeared. The authors give a large number of estimations of the sugar in blood and serum, especially in the case of dogs after bleeding, where there is an increase of blood sugar, and call attention to the possible clinical importance of differentiating between the blood of the corpuscles and the serum.

S. B. S.

The Behaviour of the Red-blood Corpuscles in Chronic Oleic Acid Poisoning. ALEXANDER SCHMINCKE and FERDINAND FLURY (*Arch. exp. Path. Pharm.*, 1910, 64, 126—140).—If the red corpuscles contain the normal amount of iron, they show an increased specific resistance towards the haemolytic action of oleic acid in cases of chronic poisoning by that substance in dogs; this is attributed specially to an increase of the lipid materials in the corpuscles; these consist of a mixture of saturated and unsaturated fatty acids united to cholesterol.

W. D. H.

Cocaine Haemolysis. ERNST PRIERAM (*Pflüger's Archiv*, 1911, 137, 350—358).—Koppe's hypothesis that the haemolysis produced by cocaine is due to acid decomposing the alkaloid cannot be correct, for it occurs in neutral and increases in alkaline solutions, and the same

is true for the haemolysis produced by other members of the cocaine group, eucaine and novocaine; these produce an elevation of the surface tension of the solvent in an alkaline medium. The non-toxic members of the group (ecgonine, etc.) produce little or no such change. The physical and biological properties of the alkaloids run parallel with their pharmacodynamic properties, and probably there is a causal relationship between them; the anaesthetic and toxic properties rise with the changes they produce in surface tension and haemolysis. Gros, moreover, has shown that their anaesthetic properties are increased when in an alkaline medium.

W. D. H.

Vegetable Agglutinins. FRITZ ASSMANN (*Pflüger's Archiv*, 1911, 137, 489—510).—Previous work on vegetable agglutinins is referred to in relation to such toxic proteins as ricin and abrin. Previous writers manifest a good deal of difference of opinion on the mode of action of such poisons. A number of plants (beans, vetches, etc.) yield similar, relatively non-toxic, substances, for which the term *phasin* (from *Phaseolus*) is adopted. Details are given of the agglutinating action on various kinds of blood of both the toxic and non-toxic members of the group. The non-toxic compounds are believed to contain the same agglutinating component as is present in such toxic compounds as ricin, but to be destitute of the toxic element.

W. D. H.

Calcium Metabolism. I. A New Method for the Quantitative Estimation of Small Variations of the Calcium Content of the Blood. N. VOORHOEVE (*Biochem. Zeitsch.*, 1910, 30, 195—206).—The method depends on the determination of the amount of calcium necessary to add to the blood to produce clotting after the natural content has been removed by the addition of ammonium oxalate. A syringe of 5 c.c. capacity is so constructed that it can be automatically half-filled with physiological saline containing 229 mg. of ammonium oxalate in 100 c.c. The blood is then sucked into the syringe directly from the veins, and immediately mixed with the oxalate solution. After several hours, small measured portions are taken and mixed with varying quantities of calcium chloride, isotonic with the saline, and diluted with it to a definite bulk. In this way, the amount of calcium necessary to precipitate the excess of oxalate and thus produce clotting can be determined, from which the original calcium content of the blood can be calculated. Control experiments, where determinations were made by mixing the calcium solution with ascitic fluid, etc., show that the results obtained are independent of the amount of proferment present.

S. B. S.

The Behaviour of Chlorine in the Serum. PETER RONA (*Biochem. Zeitsch.*, 1910, 30, 332).—An admission that the "compensation-dialysis" method for estimating the chlorine in serum (this vol., ii, 50) was employed previously by Zunz and Loewy. S. B. S.

Trypsin Action. The Tryptic Digestion of Casein. MAX SIEGFRIED (*Pflüger's Archiv*, 1910, 136, 185—202).—According to the

old theory of Kühne, on hemi- and anti-products of digestion, casein (a hemi-protein) should not yield a peptone on tryptic digestion; it was, however, proved by the use of the iron method for isolating peptones that a peptone can be isolated from a tryptic digest of casein. This is regarded as a chemical unit, and a few incomplete details are given of its cleavage products; the large quantity of ammonia and the small amount of nitrogenous substances which are precipitable by phosphotungstic acid are noteworthy points.

W. D. H.

The Formation of Carbohydrates from Fat in the Animal Organism. PETER JUNKERSDORF (*Pflüger's Archiv*, 1910, 137, 269—328).—In dogs during inanition, during fat feeding, and when under the influence of phloridzin and free from glycogen, there is a genetic relationship between the excretion of nitrogen and sugar. In phloridzinised animals, the whole of the sugar, however, cannot originate from protein because of the high sugar:nitrogen quotient, and the conclusion is drawn that part of it comes from fat. In dogs fed on fat, there is at death abundance of body-fat present, and the nitrogen and sugar excretion sink. The highest excretion, both of nitrogen and sugar, is shown by those phloridzinised dogs which receive abundant protein and carbohydrate food.

W. D. H.

The Influence of Muscular Work on the Decomposition of Subcutaneously-administered Sugar. HERMANN HOHLWEIG (*Zeitsch. Biol.*, 1911, 55, 396—408. Compare Abstr., 1909, ii, 162).—In continuation of previous work it is shown that after the subcutaneous injection of sugar, the amount which passes into the urine is diminished during muscular work in the dog. This amount (about 20%) is accounted for on the hypothesis that it is utilised as a source of energy by the muscles. Sugars also, which the cells are unaccustomed to, are similarly utilised, and details of experiments show the fact to be so for galactose, sucrose, and maltose. Lactose, however, passes quantitatively into the urine both during rest and muscular activity.

W. D. H.

The Chemistry of Honey Formation. M. KÜSTENMACHER (*Biochem. Zeitsch.*, 1910, 80, 237—254).—The author gives a detailed account of the morphology of the alimentary tract of the bee. In conversion into honey, the nectar undergoes the following changes: part of the water is evaporated, the sucrose undergoes almost complete inversion, the starch is converted into dextrin, the tannins are oxidised and partly deposited on the walls of the honey cells, the oxalic acid disappears and is resorbed by the body of the bee, and the odorous substances undergo a like fate; the mineral substances are partly resorbed and partly reappear in the honey. The invertase is derived, not from the bee itself, but from the spermatoplasma of the pollen. Diastase, however, could not be detected in the pollen, but arises probably from the saliva or gastric secretion of the animal.

S. B. S.

Protein Metabolism. FRANZ FRANK and ALFRED SCHITTENHELM (*Zeitsch. physiol. Chem.*, 1910, 70, 98—128).—Experiments on dogs confirm Michaud's discovery that the kind of protein given influences

the minimum amount capable of maintaining nitrogenous equilibrium after inanition. Much more is necessary of a foreign protein than if the protein of dog's muscle is given.

W. D. H.

The Fate of Injected Foreign Proteins and Peptones. II. DE WAELE and ALBERT J. J. VANDEVELDE (*Biochem. Zeitsch.*, 1910, 30, 227—236).—The experiments were carried out on rabbits with a known diet. The excretion of nitrogen and the protein in the urine were estimated, and the changes in the excretion noted after injection of various protein substances. When small quantities of Witte's peptone were injected there was a small addition of nitrogen to the body substances, and in the case of larger injections the animals kept approximately in nitrogen equilibrium. After injection of egg-white, a large amount of protein was excreted in the urine, which was greater than the amount injected, and came therefore partly from the animal's own body, as it underwent loss of weight. After a second injection the loss of weight is smaller. Part of the increased nitrogen output is in the form of urea. From the results obtained by themselves as well as those of other observers, the authors draw the conclusion that the animals gradually acquire the capacity of peptonising the injected proteins.

S. B. S.

Chemical and Microscopical Investigation on Fat Transport through the Intestinal Wall during Absorption. ALFRED NOLL (*Pflüger's Archiv*, 1910, 136, 208—247).—On the grounds mainly of microscopical and microchemical examination (with osmic acid), the conclusions are reached that the fat which is seen in the epithelial cells has the same composition as that in the chyle, that the fat in the epithelium cells is absorbed as fat, and not as its cleavage products, and that the fat the course of which can be followed in this way microscopically only accounts for a part of that which is actually absorbed.

W. D. H.

The Carbamino-Reaction. WALTER SULZER (*Pflüger's Archiv*, 1910, 136, 712—723).—If carbon dioxide is passed through a cooled solution of an amino-acid in lime water or baryta water, the amino-acid takes up carbon dioxide, and a carbamate of calcium or barium is formed. Other organic amino-compounds and hydroxyl compounds react in a corresponding way. This reaction, which has been particularly studied by Siegfried, is described at length for many such compounds, and is believed to have a physiological interest. Researches with serum, peptone, and crystallised serum albumin have shown that substances are present in the blood and lymph which give the reaction. The carbamates formed are readily decomposed, and possibly come into action in such physiological occurrences as the production of carbon dioxide in muscles, or in the liberation of hydrochloric acid in the gastric juice.

W. D. H.

Physiology of Cell-Division. III. Action of Calcium Salts in Preventing the Initiation of Cell-Division in Unfertilised Eggs through Isotonic Solutions of Sodium Salts. RALPH S. LILLIE (*Amer. J. Physiol.*, 1911, 27, 239—307. Compare Abstr. 1910, ii, 522).—The addition of small quantities of calcium chloride to

isotonic solutions of sodium salts (1) prevents the rapid increase in permeability produced in the unfertilised eggs of *Asterias* and *Arcacia* by the pure solution; (2) lessens the toxicity of the solution, and (3) prevents the membrane formation and initiation of cell-division which are induced by the pure solution. The toxic action of the pure salt solution and its action in initiating cell-division are due primarily to a condition of increased surface permeability. This increase is, however, temporary in normal favourable parthenogenetic fertilisation. Treatment with hypertonic sea-water, after the formation of fertilisation membranes by salt solution, leads to an increase in the proportion of successfully developing eggs.

W. D. H.

The Dextrose of the Egg and its Biological Significance.
VINCENZO DIAMARE (*Rend. Accad. Sci. Fis. Mat. Napoli*, 1910, [iii], 16, 242—244. Compare Abstr., 1910, ii, 320).—From experiments with eggs of the domestic fowl and of *Testudo graeca*, it appears that those nearing maturity (in the ovary) contain dextrose, of which about equal amounts are removed by dialysis and hydrolysis respectively. In the younger eggs the proportion of dialysable sugar is less, and in the very smallest no reducing sugar is present.

R. V. S.

Lipoid Nature of an Active Substance Secreted by the Corpus Luteum of Mammals. P. BOUIN and P. ANCEL (*Compt. rend.*, 1910, 151, 1391—1393).—When the corpus luteum of a sow is extracted with physiological salt solution, a turbid extract is obtained. After centrifugation, the clear liquid is found to show no characteristic physiological properties, the substance in suspension, however, when injected into rabbits produces sneezing, nystagmus, convulsions, and finally death from respiratory arrest. The active substance does not occur in any other part of the ovary. Its behaviour towards solvents, acids, and alkalis, and its stability to heat when dry, suggest that the substance is of a lipoid nature.

W. O. W.

The Alkaline Odour. MAX VON FREY (*Pflüger's Archiv*, 1910, 186, 275—281).—The so-called alkaline taste is really due to the sense of smell; it depends on the development of volatile bases (methylamines) which are decomposition products of epithelial cells. Freshly secreted saliva does not contain these bases.

W. D. H.

Sulphur Compounds of the Nervous System. II. A Sulphatide from Nerve Substance. WALDEMAR KOCH (*Zeitsch. physiol. Chem.*, 1910, 70, 94—97).—The sulphatide was prepared from human brain; the analytical figures given of various preparations do not appear very concordant; the S:N ratio is given as 1:3.03. The preparation regarded as the purest contained 3.1% of potassium. The sulphur is considered to act as a link in connecting phosphatides and cerebrosides.

W. D. H.

Chemical Investigations of Healthy and Rachitic Bones.
H. GASSMANN (*Zeitsch. physiol. Chem.*, 1910, 70, 161—170).—Normal
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bones contain about 1% more water than those in rickets; calcium, phosphoric acid, and carbon dioxide are less in rachitic than in normal bones. The relationship $\text{Ca} : \text{PO}_4 : \text{CO}_2$ is the same in both; and the complex in which they are contained is suggested to be (I). Other details given refer to magnesium (increased in rickets), potassium, sodium, chlorine, etc.

W. D. H.

Action of Tervalent Ions on the Heart and on Certain Colloidal Systems. GEORGE R. MINES (*Proc. physiol. Soc.*, 1910, xvii-xviii; *J. Physiol.*, 41).—Eight simple tervalent positive ions which were examined agree in producing diastolic arrest of the frog's heart when perfused at a concentration of 0·0001M. They also all confer a positive charge on gelatin and on agar-agar, and precipitate, in very low concentration, a variety of colloidal solutions with negative particles. The complex tervalent positive ion, $\text{Co}(\text{NH}_3)_6^{+}$, scarcely affects the heart in concentrations one hundred times greater, but it precipitates negative colloidal solutions, and confers a positive charge on agar-agar. It differs from the simple ions in its inability to precipitate unboiled diluted egg-white or dialysed haemoglobin, or to confer a positive charge on gelatin or frog's red corpuscles.

The tervalent negative ions of the citrate and phosphate arrest the heart in diastole in concentration 0·01M. They powerfully antagonise the effects of acid or of tervalent positive ions on the heart. These actions are not shared by the tervalent negative ion of the ferricyanide, the latter also differs from the other two by being inactive in conferring a negative charge on a gelatin membrane. In the action of tervalent ions on certain colloidal systems there exists an unexplored factor qualifying the familiar valency law of precipitation and Perrin's law. This factor is also of physiological importance. W. D. H.

The Relationship of Kidney Function and the Glycogen of the Liver. HERMANN FRIEDRICH GRÜNWALD (*Arch. exp. Path. Pharm.*, 1910, 64, 147—160).—Any severe bilateral kidney injury (extirpation, ligature of renal arteries or veins, or ureters) leads to a disappearance of the hepatic glycogen in spite of feeding on dextrose. The action is attributed to the lack of a chemical stimulus from kidney to liver; extirpation of the right kidney produces no such effect; but extirpation of the left kidney (except when it has previously been denervated) and injuries which involve the left kidney nerves, lead to a great diminution of the glycogen in the liver. There is, therefore, in addition to the hormone, a nervous stimulus, which without passing through the central nervous system runs in the path of the nerves on the left side. The experiments were performed on rabbits.

W. D. H.

Formation of Sugar in the Liver. M. LOEWIT (*Pflüger's Arch.*, 1910, 136, 572—594).—Numerous researches have shown that the liver can produce sugar from substances which are not carbohydrate, and in the present research it is shown that the liver free from

glycogen will produce sugar after death. What the parent substance or substances of the sugar are is a question discussed at length, but left still open. Tissues other than the liver yield under similar conditions either no sugar after death, or only mere traces.

W. D. H.

The Isolation of a Uricoclastic Ferment. GINO GALEOTTI (*Biochem. Zeitsch.*, 1911, 30, 374—383).—Solutions containing this ferment in an active condition were obtained from the livers of the dog and the dog-fish in the following manner: The organ was ground with sand, and the juice expressed at 300 atmospheres. The juice was diluted with water, the fat separated, and an equal volume of acetone added. The precipitate was then filtered off as rapidly as possible, and the last traces of acetone removed by spreading on filter paper. The ferment was extracted from the precipitate by means of a very dilute solution of sodium chloride.

W. J. Y.

Chemical Factors of Fatigue. W. BURRIDGE (*J. Physiol.*, 1910, 41, 285—307).—In a muscle nerve preparation very small quantities of sarcoclastic acid produce fatigue phenomena, by acting specially on the end-plates. If more than the merest trace is present free, fatigue occurs; therefore in muscle the lactic acid formed even in rest must be neutralised, and creatine is credited with a power to perform this neutralisation. Another chemical factor in fatigue is believed to be the liberation of potassium salts from the active muscles; these also affect primarily the nerve-endings.

W. D. H.

The Replacement of Calcium in so-called Physiological Fluids. (Experiments on the Excitability of Striated Muscles of Warm-blooded Animals, and the Variations of Tonus of the Atrium in *Emys europea*.) GIUSEPPE BUGLIA (*Zeitsch. Biol.*, 1911, 55, 343—359. Compare Abstr., 1910, ii, 630).—The excitability direct and indirect of striated muscles soon disappears in Ringer's solution if the calcium in it is omitted, and is restored on the restoration of that element. The place of calcium cannot here be taken by caesium. In the variations of tonus in the atrium of the tortoise, caesium also has not the same action, and cannot replace calcium. In both varieties of striped muscle, the action of caesium is different from what occurs in smooth muscle.

W. D. H.

Investigations on Smooth Muscle. IV. The Replacement of Calcium in so-called Physiological Fluids. (Experiments on Smooth Muscle; Dog's Oesophagus.) GIUSEPPE BUGLIA (*Zeitsch. Biol.*, 1911, 55, 360—376. Compare Abstr., 1910, ii, 630).—In maintaining the rhythmical contractions of the smooth muscle of the dog's oesophagus, it has been previously shown that caesium chloride can replace calcium chloride in Ringer's solution. Caesium nitrate or iodide can also be used; the sulphate is not so efficacious, the anion appearing to have a harmful effect. A large number of other metallic salts were employed with negative results; the only one found to act like caesium-chloride was rubidium chloride.

W. D. H.

Some Changes in Normal Tissues Produced by Radium. ALBERT S. GRÜNBAUM and HELEN G. GRÜNBAUM (*Proc. physiol. Soc.*, 1910, xviii; *J. Physiol.*, 41).—Radium destroys liver cells, but only to a short distance; in the gall bladder no obvious changes occur; in the stomach an atrophic fibrosis of the mucous membrane and destruction of the submucosa take place. The effect on incubating eggs is like that of *X*-rays, to destroy the embryo. In the skin the inflammation produced is characterised by a relative absence of polynuclear leucocytes and the presence of many plasma cells. W. D. H.

A Microchemical Method for Demonstrating the Presence of Guanine in Tissues. AMATORE DE GIACONO (*Zeitsch. wiss. Mikroskop.*, 1910, 27, 257—258).—A method was required for demonstrating the presence of guanine in the renal system of birds. The animal tissue (after the usual preparation) is treated with a solution of diazobenzenesulphonic acid (which has been previously tested and found sensitive to guanine); after about ten minutes, sodium hydroxide is carefully added, when the presence of guanine is shown by a red coloration; in its absence the tissues remain pale yellow F. M. G. M.

The Oxidation of Succinic Acid by Animal Tissues. FA. BATTELLI and LINA STERN (*Biochem. Zeitsch.*, 1910, 30, 172—194).—All tissues of higher animals possess the capacity of oxidising succinic acid. This oxidation does not cause an increased output of carbon dioxide, as inactive malic acid is the product produced. The most active tissues are the heart, muscle, and liver, with the exception of rabbit's muscles. The oxidative power of the blood is not very marked. The substance causing the oxidation cannot be extracted from the tissues by water, and the tissues also lose their oxidative capacity after extraction with alcohol or acetone. The reaction takes place best in neutral or slightly alkaline media at the optimum temperature of 40°. The reaction rate is greater in pure oxygen than in air. Hydrocyanic acid acts toxically on the reaction, but other substances, such as arsenious acid and sodium fluoride, have but a relatively small effect. S. B. S.

The Biological Significance of Inositolphosphoric Acid (Phytin). EMIL STARKENSTEIN (*Biochem. Zeitsch.*, 1910, 30, 56—98).—It was found that inositolphosphoric acid gives a precipitate with uranium, magnesium, and lead salts, but not with ammonium molybdate in nitric acid solution. For this reason, only the latter reagent is available for estimation of free phosphoric acid in the presence of phytin. The commercial preparation of the latter substance contains free inositol and phosphoric acid. To prepare pure phytin from the commercial product, the latter is dissolved in dilute acetic acid, and lead acetate is added; only the inositolphosphoric acid lead salt is precipitated. This, after washing and decomposition, is decomposed by hydrogen sulphide, and the filtrate is treated with glacial acetic acid and calcium acetate until precipitate is formed. The pure phytin (inositolphosphoric acid) is then obtained in the form of an

insoluble calcium salt. The conclusion is drawn from the analysis of the salts that phytin is a complex derivative of pyrophosphoric acid (for which a formula is suggested). The author gives an exhaustive review of the literature, from which is drawn various conclusions, the chief being that the free inositol in the body has no particular physiological significance. In view of the fact that ino-itolphosphoric acid is also precipitated by various reagents for phosphates, he draws attention to various possible errors in phosphate estimation in urine, etc.

S. B. S.

Tetrodon Poison. YOSHISUMI TAHARA (*Biochem. Zeitsch.*, 1910, 30, 255—275).—The toxin was extracted from the ovaries of the fish, and from the aqueous extract the proteins were separated by heating the solution after acidification with acetic acid. From the solution thus obtained, the phosphates, etc., were precipitated by lead acetate. From the filtrate, on addition of ammonia (not more than 0·34%), the toxin is precipitated with lead acetate. This is then decomposed with hydrogen sulphide. On evaporating under low pressure to a syrup and adding alcohol, a precipitate is formed, whilst the greater part of the toxin remains in solution and can be precipitated therefrom by the addition of ether. From the precipitate, by redissolving in water and treating as before with alcohol and with ether, a further amount of toxin can be obtained. The tetrodotoxin obtained in this way is not pure, but contains a sugar, *tetrodopenose*, which is deposited in stout, colourless prisms on keeping the solution, and a crystalline base, which does not melt even at 280°, has the formula $C_{11}H_{11}O_9N_9$, and can be precipitated as an aurichloride from a solution of the crude tetrodotoxin. The tetrodotoxin, freed as completely as possible from these two substances, has the approximate formula $C_{16}H_{13}O_{14}N$. It is very soluble in water, but is insoluble in most organic solvents, although soluble in aqueous alcohol. It reduces Fehling's solution, and its toxic dose was found to be 0·0041 mg. per gram of body-weight for mice, and 2·5 to 4 mg. per kilo, for rabbits. The toxicity is readily destroyed by mineral acids, alkalis, and strong ammonia. Tetrodotoxin is neither acid nor base, and yields on hydrolysis a base and a crystalline substance. The author considers that tetrodotoxin is not a protamine. S. B. S.

Occurrence of Hæmatoporphyrin in the Meconium. V. BORRIEN (*J. Pharm. Chim.*, 1911, [vii], 3, 59—63).—Hæmatoporphyrin has been detected spectroscopically in a purified acetone extract of the meconium. The author suggests, therefore, that the passage from blood pigment to biliary pigment takes place in the following stages: haemoglobin \rightarrow hæmatoporphyrin \rightarrow bilirubin. T. A. H.

The Catalase of Milk. FRANZ SPINDLER (*Biochem. Zeitsch.*, 1911, 30, 384—412).—The activity of the catalase was compared in a number of samples of milk from healthy and diseased cows, and also in preparations from cow's milk and in milk from other animals. A measure of the activity was obtained by determining the total volume of oxygen liberated at 37° by 15 c.c. of milk from 5 c.c. of 1% hydrogen peroxide by means of Lobeck's "catalase glass."

It was found that the activity was greater in sour than in fresh milk, and increased with the age of the milk. This was, however, partly due to the growth of moulds in the milk. Sour milk products, like Bulgarian "Yoghurt" and "Kephir," also contained more active catalases than fresh milk. Diseases of the udder and other complaints were accompanied by a markedly increased activity in this ferment, and this activity decreased to the average for normal milk as the animal regained its health. The method is suggested as a means of detecting disease in cows.

W. J. Y.

The Excretion of Subcutaneous Injections of Sodium Chloride, and their Effect on Nitrogen Metabolism. G. TROSIANZ (*Zeitsch. Biol.*, 1910, 55, 241—266).—Dogs were kept on a constant diet containing known quantities of sodium chloride, phosphoric acid and nitrogen, and the daily excretion of these three substances determined in the urine and faeces. In each case, after a period of from two to four days, solution of sodium chloride was injected, and the effect produced on these excretions observed. The effect was tried of varying the concentration of the salt (1) when the diet employed was rich in sodium chloride; (2) when the food contained only small quantities of this salt, and (3) during starvation. The injections varied from 116 c.c. of 0·3% NaCl to 20 c.c. of 10% NaCl. Similar experiments were also carried out, in which 100 c.c. of a solution of urea (5 or 10%), containing in some cases 1% NaCl, were injected into the animals. It was found that when equal amounts of sodium chloride were injected, the time required for the whole to reappear in the excretions was less the more concentrated the solutions employed. With a diet rich in sodium chloride, injections of hypo- and iso-tonic solutions of sodium chloride caused no perceptible increase in the nitrogen output, hypertonic solutions produced a slight increase, whilst urea was almost quantitatively recovered in the excretions, and had no effect on the nitrogen metabolism.

With food poor in sodium chloride, even hypotonic solutions of salt produced a marked increase in the nitrogen excreted.

The effect was still further marked in the case of starving animals, both salt and urea causing an increased nitrogen metabolism.

Practically no changes were observed in the phosphoric acid excreted.

W. J. Y.

The Excretion of Phosphates Ingested per os, Especially of Calcium Phosphate. RAGNAR BERG (*Biochem. Zeitsch.*, 1910, 30, 107—142).—The author carried out a series of experiments on his own person, taking over long periods of time diets with small calcium content, in which the caloric value and the protein, fat, carbohydrate, calcium, magnesium, and phosphoric acid contents were known. This was done with the object of diminishing the calcium store in the body. During the period of this diet, he rapidly lost weight. At certain intervals during the experiment he added to his diet the following sources of calcium and phosphorus:—Calcium phosphate (neutral) and calcium hydrogen phosphate, calcium hypophosphate, lecithin, lecithin and calcium lactate, and calcium lactate alone. The phosphate,

magnesium, and calcium were estimated both in the urine and faeces. He draws the conclusion, from a long series of experiments, that these substances are of little therapeutic value in increasing the calcium and phosphate stores in the body. Tricalcium phosphate is excreted mostly in the faeces, and the acid calcium phosphate is positively harmful, in that it is also excreted in the faeces as neutral salt, and actually draws on the phosphoric acid store in the body. The effect of these preparations on diuresis and acidosis is also discussed.

S. B. S.

The Influence of the Fat of the Food on the Excretion of the Acetone Substances. GUNNAR FORSSNER (*Skand. Arch. Physiol.*, 1910, 23, 305—325).—The experiments were made with the object of determining the influence of the amount of fat ingested on the excretion of β -hydroxybutyric acid and acetone, and were performed on the person of the author. The constant diet taken contained only a small amount of carbohydrate, and relatively large amounts of fat. To eliminate the influence of stored glycogen, a definite amount of hard exercise was taken each evening, and during the investigation the conditions of living were kept as constant as possible. On certain days, definite additional amounts of fat (olive oil) were ingested after the period of exercise and before retiring to rest, and the influence of this added fat was determined by estimating the amount of acetone substances excreted in the urine in different periods during the course of the investigation. From the results, the author draws the conclusion, amongst other things, that the addition of fat to the food causes an increased output in the acetone substances, which is approximately proportional to the amount of added fat.

S. B. S.

Studies on Water Drinking. III. Uric Acid Elimination following Copious Water Drinking between Meals. S. A. RULON and PHILIP B. HAWK (*J. Amer. Chem. Soc.*, 1910, 32, 1686—1691. Compare Abstr., 1910, ii, 625).—It has been stated by some authors that the ingestion of large quantities of water has the effect of decreasing the amount of uric acid excreted, whilst others have stated that it has the opposite effect. Experiments have now been made to ascertain the influence of copious water drinking between meals on the elimination of uric acid. The subjects were two men, aged twenty-four and twenty-nine, and a uniform diet was maintained throughout the experiments. In one case, the data showed that the amount of uric acid excreted was not affected, whilst in the other case they indicated that there was a marked decrease in the quantity. It is considered, however, that the latter result was probably due to the fact that the Folin-Shaffer method of estimation which was employed does not give a sufficiently high result with urines of very low sp. gr. The urines in the other case were of such a character as to admit of accurate estimation, and it is therefore considered probable that the ingestion of large quantities of water does not have any influence on the amount of uric acid excreted.

E. G.

The Relation of the Precursors of the Normal Yellow Pigment of Urine to the Diazo-reaction, and a Colorimetric Estimation of Urochrome and Urochromogen. MORITZ WEISZ (*Biochem. Zeitsch.*, 1911, 30, 333—356).—The proteic acid fraction of urine, which is precipitated by baryta and alcohol, yields a precipitate with basic lead acetate containing the normal yellow pigment (the urochrome of Thudichum and Garrod) and the urochrome obtained by Dombrowski by means of copper acetate. These two pigments are not identical, and may be separated from each other by means of the greater solubility of the lead salt of the normal yellow urochrome in dilute acetic acid.*

The substance in pathological urine which brings about Ehrlich's diazo-reaction (red coloration with a mixture of aniline-*p*-sulphonic and nitrous acids) is precipitated from the proteic acid fraction by mercury acetate. The nature of this substance is not known, but it is termed urochromogen on account of its properties. Another urochromogen is found in urine; this does not give the diazo-reaction, but on digesting the urine for some time, it changes into a urochromogen which does give the reaction; it is therefore termed urochromogen- α , and the other urochromogen- β . Both these substances yield on oxidation a urochrome identical with the normal yellow pigment of urine.

Urochrome and its precursors are probably produced from the protein of the cell, and the presence of urochromogens in pathological urine points to a change in the metabolism of the organism brought about by toxic substances.

Estimations of the urochrome in different urines were made by precipitating the other pigments with ammonium sulphate, and comparing the filtrate in a Dubosq colorimeter with a standard solution of a yellow dye, the quantity of urochrome being expressed in terms of the standard. The urochromes were estimated in the same manner after oxidation to urochrome.

W. J. Y.

Narcotics and Local Anaesthetics. OSCAR GEOS and C. HARTUNG (*Arch. exp. Path. Pharm.*, 1910, 64, 67—71. Compare Abstr., 1910, ii, 793).—Details are given of the limits of concentration which produce narcosis in tadpoles, etc., of cocaine, eucaine, novocaine, and alypine.

W. D. H.

The Significance of the Active Constituent of the Suprarenal Capsules in Conjunction with Local Anaesthetics. P. ESCU (*Arch. exp. Path. Pharm.*, 1910, 64, 84—104).—The addition of adrenaline to novocaine, alypine, and especially cocaine intensifies their local narcotic action. This is a specific influence on nerves. The addition of adrenaline to tropococaine does not increase its action.

W. D. H.

The Influence of the Presence and Position of the various Radicles of Adrenaline on its Physiological Activity. C. H. H. HAROLD, MAXIMILIAN NIERENSTEIN, and HERBERT E. ROAF (*J. Physiol.*, 1910, 41, 308—317).—The activity of adrenaline is largely dependent on the presence of an amine (or substituted amine)

group separated from the benzene nucleus by some other group. Two hydroxyls attached to the benzene ring in the 3:4-position increase the action, and when these are present, the placing of a secondary alcohol group between the benzene ring and the amine-containing group intensifies the activity. In the latter case it is the levorotatory compound that is mainly responsible for the "sympathomimetic action."

W. D. H.

The Production of Glycosuria by Adrenaline in Thyroidectomised Dogs. FRANK P. UNDERHILL (*Amer. J. Physiol.*, 1911, 27, 331—339).—Renewed investigation concerning the efficiency of adrenaline in provoking glycosuria in thyroidectomised dogs confirms the author's previous conclusion that doses of 1 mg. per kilo. of body-weight causes glycosuria in dogs deprived of both thyroids, but retaining at least two parathyroids; these dogs thus resemble normal dogs. Falta and Rudinger's criticisms in no way invalidate this conclusion.

W. D. H.

The Fate of Cineol (Eucalyptol) in the Organism. JUNO HÄMÄLÄINEN (*Skand. Arch. Physiol.*, 1910, 24, 1—12).—After oxidation of the metabolism product (a glycuronate) with permanganate, the author succeeded in isolating cineolie acid, from which he draws the conclusion that the cineol, before conjugation, is oxidised, yielding one of two possible products of which he gives the formulae. It was also noticed that the toxic action of the cineol was greatly diminished in animals which had been immunised with emulsin, and the urine of such animals after cineol ingestion is much more strongly levorotatory than in non-immunised animals. The author gives reasons for deducing from these facts that the glycuronate formed after cineol ingestion has the β -glucoside structure. S. B. S.

Physiological Action of Organic Bases. A. BRISSEMORET and A. JOANIN (*Compt. rend.*, 1910, 151, 1151—1153).—The physiological effect of an organic base is regarded as the resultant of the effects of the hydrocarbon residue and the basic nitrogen-containing group. It has been found by experiments on dogs that in the case of coniceine the secondary narcotic effects are similar to those induced by α -octane. In the same way, the narcosis produced by morphine can be imitated by intraperitoneal injection of hexahydrophenanthrene, the parent hydrocarbon of the alkaloid. W. O. W.

Physiological Action of β -Iminoazoleethylamine [4- β -aminoethylglyoxaline]. HENRY H. DALE and PATRICK P. LAIDLAW (*J. Physiol.*, 1910, 41, 318—344).—This amine is produced when carbon dioxide is split off from histidine. It is identical with one of the ergot bases (compare Barger and Dale, *Trans.*, 1910, 97, 2592). It has a direct stimulating effect on plain muscle, especially of the uterus and the bronchioles; cardiac muscle is mildly stimulated, and skeletal muscle not affected. In rodents it produces a rise of blood pressure unless this is masked by embarrassed respiration; in carnivora the direct action on plain muscle in the systemic arterioles

is overcome by an antagonistic peripheral action, the mechanism of which is not clear. The result is general vaso-dilatation (in which the kidney vessels do not participate), and a fall of arterial pressure; the pulmonary pressure rises. The drug also produces narcosis, and is a mild direct stimulant to the salivary glands and pancreas. The general effect is not unlike that of the injection of Witte's peptone and of certain agar extracts, and of Popiel's "vasodilatin." The base has in fact been separated from intestinal extract. It has no effect on blood coagulability. It is further pointed out that the general effect is not unlike that seen in anaphylaxis.

W. D. H.

Pharmacology of the Rue (*Peganum harmala*). FERDINAND FLURY (*Arch. exp. Path. Pharm.*, 1910, **64**, 105—125).—The physiological action of some of the derivatives was investigated, namely, harmine ($C_{13}H_{12}ON_2$), harmaline ($C_{13}H_{14}ON_2$), dihydroharmaline ($C_{13}H_{16}ON_2$), and apoharmine ($C_8H_8N_2$). The first three have a paralysing action on frogs, whilst apoharmine causes increased reflex, irritability and tetanus. Harmine and harmaline paralyse the skeletal and cardiac muscle of the frog. Harmaline has an anthelmintic action, probably by paralysing the musculature of the parasites. In warm-blooded animals, harmine and harmaline cause convulsions, increase of saliva, interference with respiration, and depression of temperature. In the East the seeds are used as a substitute for hashish, and in dogs it is evident that psychic disturbances occur. The drugs are partly destroyed in the body (blood, liver, and nervous system), and partly excreted by the kidneys and intestine.

W. D. H.

Comparative Effects of Yohimbine, Protoveratrine, and Veratrine on Isolated Muscle and Nerve. AUGUSTUS D. WALLER (*Proc. physiol. Soc.*, 1910, xi—xiv; *J. Physiol.*, 41).—The results described confirm the author's previous conclusion, that veratrine especially affects muscle, and protoveratrine, nerve. The characteristic effect on nerve produced by protoveratrine is not produced by yohimbine, although Tait regards the two drugs as pharmacologically identical.

W. D. H.

The Toxic Action of the Free Fatty Acids in Animal and Vegetable Fats and Oils. J. HERTKORN (*Chem. Zeit.*, 1911, 35, 29—30).—The decompositions taking place when a fat or oil becomes rancid result in the formation of lower and higher fatty acids and aldehydic substances, etc. It may happen that higher aldehydes are formed, and these, together with the acids (crotonic, acrylic, etc.) into which they are readily converted, may cause the injurious effects noted when rancid fats and oils are consumed.

W. P. S.

The Sensitising Action of Hæmatoporphyrin. WALTER HAUSSMANN (*Biochem. Zeitsch.*, 1910, **30**, 276—316).—If paramaecia are exposed to light in solutions containing small quantities of hæmatoporphyrin, which in the dark is harmless, they rapidly die. This is a case of photosensitisation, as if they are treated with

the same solution in the dark after the solution has been exposed to light, the paramecia remain alive. The toxic action is not due therefore to a decomposition product of the haemato porphyrin after exposure to light. The most active rays, as determined by light filters, are those of about $500\mu\mu$. Haemato porphyrin solutions under the same conditions can also act haemolytically. Furthermore, if haemato porphyrin is injected into mice, and the animals are exposed to light, toxic effects are produced which can ultimately end in death. Control animals kept in the dark remain healthy. According to the degree of light to which the animals are exposed, or the time which has elapsed since injection, various stages of intoxication can be distinguished, namely, acute, sub-acute, or chronic. The various symptoms characterising these stages are described in detail by the author. The injury to the peripheral vessels seems to be the primary effect of the toxins. When toxic action took place, no haemato porphyrin could be found in the blood (tested by the haemolysis method). White mice are much more sensitive to the haemato porphyrin action than grey or black mice. In the case of the latter, no lethal effects were ever experienced.

S. B. S.

Chemistry of Vegetable Physiology and Agriculture.

The Oxidation of Phenol by Certain Bacteria in Pure Cultures. GILBERT J. FOWLER, EDWARD ARDERN, and WILLIAM T. LOCKETT (*Proc. Roy. Soc.*, 1910, 83, B, 149—156).—It was noticed that phenol was oxidised on bacterial sewage filters from which three or four different organisms could be afterwards isolated. The chief were *Bacillus liquefaciens fluorescens*, a liquefying organism, and another organism which Sidebotham has identified with *B. Helvolus* (Zimmermann). The experiments, made with cultures on various media, show that the oxidation of phenol is due to the latter organism, which can grow on media in which the phenol is the only source of carbon.

S. B. S.

Production of Acid and Alkali by Diphtheria Bacilli. K. A. JACONSEN (*Centr. Bakt. Par.*, 1910, i, 16—27).—The results both of Madsen (*Zeitsch. Hyg.*, 26) and of Lubenau (*Arch. Hyg.*, 66) are confirmed, their divergence being due to different experimental conditions.

N. H. J. M.

Production of Nitrite by Bacteria. ERICH PELZ (*Centr. Bakt. Par.*, 1910, i, 59, 1—16).—In addition to cholera vibrios a number of bacteria have the power of reducing nitrates to nitrites. These are divided into three groups, according to the vigour with which they act on nitrates. The most active are the cholera vibrios, *Paratyphus B.*

mouse typhus, *Aerogenes*, *Vibrio Nordhafen*, *Vibrio Metchnikoff*, swine cholera, and some varieties of type Flexner.

The following bacteria show less activity in producing nitrites: Typhus, Paratyphus A., *Enteritis* Görtner, *Bacterium coli*, Yersin, and *Proteus Dysenteriae*. The production of nitrites by this group never exceeded 18—20 mg. in 50 c.c. It is, however, possible that some of the nitrite produced underwent further decomposition, with liberation of free nitrogen. No ammonia could be detected except in a culture of *Staphylococcus aurens*, which produced nearly 5 mg. in four days.

Dysentery bacteria of type Kruse and streptococci produce only small amounts of nitrite.

N. H. J. M.

The Chemical Reactions of Kumiss and Kephir Fermentation. I. The Kumiss of the Steppes. ALEXANDER GINZBERG (*Biochem. Zeitsch.*, 1910, 30, 1—24).—The course of the reactions occurring during the souring and fermenting of mare's milk to form kumiss was followed by mixing fresh mare's milk with an equal volume of kumiss, incubating at 25°, and determining the lactic acid, sugar, and alcohol present at intervals during the "ripening" of the mixture. The results show that the lactic and alcoholic fermentations proceed concurrently, beginning slowly and gradually increasing in intensity. At the same time the casein and albumin of the milk are acted on by the ferments, the former losing its mineral constituents, and both being partly hydrolysed.

W. J. Y.

The Chemical Reactions of Kumiss and Kephir Fermentation. II. Artificial Kumiss and Kephir. ALEXANDER GINZBERG (*Biochem. Zeitsch.*, 1910, 30, 25—38).—Kephir is produced from cow's milk by lactic and alcoholic fermentations of the sugar, which take place side by side in a manner similar to that observed during the preparation of kumiss (preceding abstract). The fermentations are not, however, carried so far as in the case of kumiss; thus kephir contains only 1% alcohol, kumiss 2 to 3%, whilst the proteins are not hydrolysed to the same extent in kephir. Artificial kephir and kumiss may be prepared from cow's and mare's milk respectively by means of a mixture of *Bacillus bulgaricus* and beer yeast. In these cases, also, the course of the reactions is similar to that described above.

A number of photomicrographs are given of the micro-organisms found in these fermentations.

W. J. Y.

Action of the Bulgarian Ferment on Proteins. GABRIEL BERTRAND (*Compt. rend.*, 1910, 151, 1161—1162; *Bull. Soc. chim.*, [iv], 9, 103—104).—The observations of Effront (this vol., ii, 61) are not in agreement with results published by the present author (Abstr., 1907, ii, 129; 1909, i, 623; Margaillan, Abstr., 1910, ii, 163). The production of lactic acid in milk by the action of the Bulgarian ferment is mainly due, in the author's opinion, to transformation of the lactose,

and not to degradation of casein. Efron's results may be due to the presence of foreign bacteria in the Bulgarian ferment employed.

W. O. W.

The Influence of Alkalies and Acids on the Autolysis of Yeast. E. NAVASSART (*Zeitsch. physiol. Chem.*, 1910, 70, 189—197).—Alkali lessens the autolysis of yeast, as it does that of animal tissues; the action is proportional to the alkali added, that is, the more alkali the less is the autolysis noted. The action of acid (hydrochloric) does not increase autolysis as it does in animal tissues, but it diminishes it. Nuclease is more affected by change in reaction than proteolytic enzymes.

W. D. H.

The Action of Rubber on Mercurial Antiseptic Solutions. A. T. GLENNY and GEORGE S. WALPOLE (*J. Hygiene*, 1910, 10, 586—588).—Mercurial solutions in which rubber articles (tubing, catheters, stoppers, etc.) are placed lose mercuric salt and the rubber is attacked, especially on prolonged immersion. The knowledge of this fact is important in view of the extensive use of mercurial solutions for sterilisation and sterile storage. The loss of mercury means that the solution is no longer of the same antiseptic strength.

W. D. H.

Conservation of Salts during the Course of Vegetation of an Annual Plant. GUSTAVE ANDRÉ (*Compt. rend.*, 1910, 151, 1378—1382).—The view has been held that loss of mineral matter may occur from osmosis through the roots and dead leaves of plants. This is not supported by the observations described in the present communication, which contains an account of experiments on beans, lupins, and pinks. No appreciable loss of salts was detected up to complete development of the plants, even when some of the leaves had partly withered, and were only acting imperfectly as organs of assimilation and elaboration.

W. O. W.

The Action of Salts on the Respiration of Plants. A. REINHARD (*Ber. Deut. Bot. Ges.*, 1910, 28, 451—455).—The author confirms a result he has previously obtained, that phosphates increase the evolution of carbon dioxide from powdered seeds, whilst other salts do not. He now works with more dilute solutions, and finds as before that nitrates tend to depress respiration and phosphates increase it.

E. J. R.

Induced Maturation of Grains. Antigerminative Action of Acetaldehyde. PIERRE MAZÉ (*Compt. rend.*, 1910, 151, 1383—1386).—Seeds of maize or peas collected from the plant when they contain 50—60% of water do not germinate when placed in a sterile atmosphere. If previously dried, however, in a vacuum, in the air, or in a current of carbon dioxide, germination is enabled to take place. This appears to be due to the removal in the latter case of volatile substances which inhibit germination. Acetaldehyde is effective in this way, and has been shown to occur in the freshly

collected seeds. It may be removed by desiccation, or by the destructive action of moulds, such as *Aspergillus*, *Mucor*, etc., which have been shown to act in this way. The juice of the young plant also contains aldehyde, and this may play an important part in regulating maturation. The oxygen absorbed by the juice of the living plant is partly employed in oxidising this to alcohol.

W. O. W.

Tolerance of Maize to Boron. HENRI AGULHON (*Compt. rend.*, 1910, 151, 1382—1383).—Plants which have been grown in a medium containing somewhat less than the fatal amount of boric acid produce seeds, the plants from which have acquired a certain measure of immunity against the poison. They benefit by the administration of small doses to a greater extent than the parent crop, and support a toxic dose more easily.

W. O. W.

Occurrence of d-Galactose. EDMUND O. VON LIPPmann (*Ber.*, 1910, 43, 3611—3612).—Following a sudden frost, the first after a late, dry, warm autumn, the berries of an ivy were observed to be covered with a colourless, crystalline efflorescence, resembling hoar frost, which proved to be galactose. No other carbohydrate was found accompanying it, and the berries themselves did not contain galactose or any substance yielding mucic acid on oxidation.

E. F. A.

Microchemical Examination of Tannins and Natural Colouring Matters. LUIGI ERMANNO CAVAZZA (*Zeitsch. wiss. Mikroskop.*, 1910, 27, 34—40).—An account of experiments on the natural colouring matters contained in plants, which the author tabulates in a list containing fifteen groups. The colour reactions given with these by various reagents are also appended.

F. M. G. M.

Intravital Caffeine Reactions. THOMAS BOKORNY (*Pflüger's Archiv.*, 1911, 137, 470—488).—Caffeine is a reagent for active albumin first introduced by O. Loew and the author. Details are given in the present paper of the reactions (mainly microchemical) produced by caffeine in various vegetable structures; the most characteristic of them is the formation of *proteosomes*, and evidence is adduced that these are not a simple precipitate of tannic acid compounds of caffeine, or of protein.

W. D. IL

Relative Proportions of Arsenic Present in Marine Algae and their Preparations. EUGÈNE TASSILLY and J. LEROME (*Bull. Soc. chim.*, 1911, [iv], 9, 63—66. Compare Gautier, Abstr., 1903, ii, 92).—The estimation of the arsenic was made by Gautier's method as modified by Bertrand (Abstr., 1904, ii, 85). The following quantities, expressed in mg. per 100 grams of seaweed, were found. *Chondrus crispus* ("Irish moss"), 0·07; *Fucus vesiculosus* ("Bladder wrack"), 0·01; "Corsican moss," 0·025; *Laminaria digitata*, 0·05; *L. saccharina*, 0·01, and *L. flexicaulis*, 0·01. "Norgin" prepared from *Laminaria* spp. contained 0·03, and "gelose," prepared from Japanese seaweed, gave 0·20 to 0·25. The amounts in Irish moss, norgin, and gelose may be due in part to the use of impure chemicals in preparing them for the

market. "Kelp" made from *L. digitata* contained the whole of the arsenic naturally present in the seaweed.

T. A. II.

Alkaloids of Datura Metel Seed. ERNST SCHMIDT (*Arch. Pharm.*, 1910, 248, 641—643).—de Plato has stated recently (*Abstr.*, 1910, ii, 742) that *Datura Metel* seed contains allantoin, but neither alkaloids nor cyanogenic glucosides. The author has therefore repeated Kircher's work on this seed (*Abstr.*, 1905, i, 717), and confirmed his observation that the chief alkaloid present is scopolamine (hyoscine). Small quantities of hyoscyamine and of a third alkaloid, giving an aurichloride, m. p. 140°, crystallising in dark yellow needles, are also present.

T. A. H.

Constituents of Iris versicolor Rhizome. FREDERICK B. POWER and ARTHUR H. SALWAY (*Amer. J. Pharm.*, 1911, 83, 1—14).—Authenticated rhizomes and rootlets of *Iris versicolor* ("blue flag root") furnished the following constituents on extraction with alcohol and separation of the alcoholic extract into (a) matter volatile in steam, (b) matter soluble in water, and (c) matter insoluble in water. Fraction (a) consisted of volatile oil, D_{20}° 0·9410, possessing a yellow colour and a strong, rather unpleasant odour. From portion (b), isophthalic acid, a trace of salicylic acid, tannin, and a reducing sugar, which gave *d*-phenylglucosazone, were isolated. The first of these substances has not been recorded from a natural product previously.

Fraction (c) was composed chiefly of a dark-coloured soft resin, forming 8·7% by weight of the crude drug. This resin contained, apart from amorphous matter, (1) a phytosterol, $C_{27}H_{46}O_2H_2O$, m. p. 133° (148° when anhydrous), $[a]_D - 35\cdot6^\circ$ in chloroform, which crystallised in colourless needles from alcohol; (2) myricyl alcohol; (3) ipuranol (compare *Abstr.*, 1910, ii, 338); (4) heptacosane; (5) a mixture of lauric, palmitic, stearic, cerotic, oleic, and linolic acids; and (6) possibly some ceryl alcohol.

Physiological tests made with the crude alcoholic extract, an aqueous extract of the drug, and fractions (b) and (c) referred to above, proved that these were all inactive. Since the physiological activity of *fresh* "blue flag root" is apparently well established, it would seem that the drug may lose its activity entirely on keeping.

T. A. H.

The Cyanogen Compounds of Tobacco Smoke. JULIUS TÓTH (*Chem. Zeit.*, 1910, 34, 1357. Compare *Abstr.*, 1910, ii, 443).—The amount of cyanide compounds (calculated as C_2N_2) in tobacco smoke is not influenced by the amount of nicotine present in the samples. The cyanide found in tobacco smoke is not due to a reaction between dicyanogen and the ammonia which is always present in the smoke, for a direct experiment showed that, contrary to Wöhler's idea, no hydrogen cyanide or other cyanides are formed when these products interact.

L. DE K.

The Glucoside of Pear Leaves [Arbutin], and its Function in Producing Autumn Tints. ÉMILE BOURQUELOT and [Mlle.] A. FICHTENHOLZ (*J. Pharm. Chim.*, 1911, [vii], 3, 5—13. Compare *Abstr.*, 1910, ii, 742).—The authors have examined leaves from a

number of trees that were formerly classified as *Pyrus*, but are now regarded by most botanists as distinct. They find that *Pyrus communis* alone contains arbutin, while none of the other trees do; none could be detected in *Cydonia vulgaris*, *Malus communis*, *Sorbus aucuparia*, or *S. torminalis*, all of which were at one time classed with *Pyrus*. There are therefore recognisable chemical characters correlated with the botanical characters, and the modern classification is justified on biochemical, as well as on morphological, grounds.

The leaves of certain varieties of *Pyrus* turn black when they fall; in other cases a golden-yellow tint first appears, but then gives place to black. The authors support Wewers' hypothesis that the black colour is due to the oxidation of quinol by an oxydase, but, as the quinol arises from arbutin, this latter substance must first undergo hydrolysis by the emulsin in the leaf before the blackening can appear. Methylarbutin does not at once produce a black oxidation product, but a yellow one, and evidence is adduced that those leaves that first turn yellow contain methylarbutin [compare H. E. and E. F. Armstrong, Proc., 1910, 26, 334].

E. J. R.

The Behaviour of Penicillium in the Presence of Acetic Acid and its Salts. JOHANNES REICHEL (*Biochem. Zeitsch.*, 1910, 30, 152).—Free acetic acid was found to have an inhibitory action on the growth of *Penicillium glaucum*. The presence in an otherwise favourable medium of a very small concentration of acetic acid (0·0123 to 0·0420*N*) considerably delayed the production of spores, whilst greater concentrations (0·0940 and 0·2996*N*) completely prevented growth. This action was not due to the hydrogen ions of the acid, since the mould grew quite well on the same medium in the presence of either sulphuric, hydrochloric, tartaric, or oxalic acid of much greater normality. It was also not caused by the acetyl ions, since acetates did not exhibit this property, which was therefore ascribed to the undissociated acetic acid.

When *Penicillium* was grown in the presence of acetates, it was observed that the acidity of the medium was decreased. It is suggested that the mould regulates the acidity of the medium by utilising the acetate as a source of carbon, thereby preventing the liberation of sufficient acetic acid to inhibit its growth. W. J. Y.

The Alkaloids in Strychnos Nux Vomica During Germination. O. TUNMANN (*Arch. Pharm.*, 1910, 248, 644—657. Compare Feldhaus, Abstr., 1905, ii, 648; Kerbosch, Abstr., 1910, ii, 110).—The author has investigated the distribution of alkaloids in *nux vomica* seeds before and after germination, and finds that there is no justification for Heckel's view that the alkaloids are wholly transformed into more assimilable substances, as one result of germination. A portion of the alkaloids is passed into the soil, another is thrown off in the seed shell, whilst a small part is used in forming a protective layer for the embryonic leaves. The following are the chief conclusions arrived at. The two alkaloids, brucine and strychnine, occur only in the oil-plasma of the endosperm cell contents. The embryo of the resting seed contains brucine only. The alkaloids of the endosperm

are not absorbed by the embryo on germination. Nearly one-third of the total alkaloids is excreted into the surrounding soil and remains there in a form insoluble in water, and probably forms a protecting layer for the rootlets. About one-fifth, together with the residue of unabsorbed endosperm, is thrown off with the seed shell. Brucine is to some extent converted into strychnine during germination, but there is no evidence of the formation of nitrates from the alkaloids. Brucine is formed first in all parts of the embryo during germination, and both alkaloids are formed before the formation of chlorophyll takes place in the leaves. The following quantities in grams of total alkaloids were found in the various parts of one seed: whole seed, 0.0556; seed shell thrown off in germination, 0.0156; young embryonic root, 0.018; older embryonic root, 0.021; hypocotyl axis, 0.003; young embryonic leaf, 0.0072; older embryonic leaf, 0.0078.

T. A. H.

Non-protein Nitrogenous Substances in the Sugar Beet. K. SMOLENSKI (*Zeitsch. Ver. deut. Zuckerind.*, 1910, 1215—1261).—The diffusion liquors of a Russian sugar factory were found to contain the following non-protein nitrogenous substances: vernine, allantoin, asparagine, glutamine (?) and betaine. Tyrosine and choline were absent. A summary of the literature available as to the rotatory power of these compounds shows that glutamine will have but little effect on the polarisation of beet juice; asparagine will slightly increase the polarisation in aqueous solution. In alcoholic solution with lead acetate, the foreign substances have no influence on the polarisation. Polarisation after inversion in presence of glutamine or asparagine will indicate an excess of dextrorotatory carbohydrate. E. F. A.

Manurial Experiments with Sugar-Beet. E. SAILLARD (*Bied. Zenfr.*, 1910, 39, 859—860; from *J. Agric. prat.*, 1910, i, 267).—Sodium nitrate and cyanamide produced about the same amounts of roots and sugar, whilst calcium nitrate gave rather higher results.

Kainite produced more roots and more sugar than the same amount of potassium as chloride. This is attributed to the magnesium present in the kainite. N. H. J. M.

Relationship between the Fertility of the Soil and the Contained Phosphoric Acid Soluble in Water. ISIDORE POUGET and D. CNOUCHAK (*Rev. gen. Chim. pure Appl.*, 1910, 18, 157—178, 219—222).—A detailed account of numerous experiments on the relationship between the fertility of soils and the contained phosphoric acid soluble in water, or in 1% citric acid solution.

The methods of culture are described, with photographs showing the relative growths of the plants experimented on; the mechanical, mineralogical, and chemical conditions of the soils are noted, and the amount and composition of the produce tabulated.

The second paper contains the results of varying the concentration of the solution of phosphoric acid supplied; when the concentration was greater than 1 mg. of P_2O_{10} per litre, the quantity absorbed was in direct proportion to the concentration; at a lower concentration the

absorption decreased more rapidly than the concentration, and at 0·1 mg. per litre assimilation practically ceased. F. M. G. M.

Barium in Soils. G. H. FAILYER (*U.S. Dept. Agric. Bur. Soils Bull.* 72, 1910).—Barium occurs in most soils in the United States, the greatest amounts being found in soils derived from the neighbourhood of barite deposits, and in soils derived from the rocks of the Rocky Mountains.

Analyses of about a hundred Colorado and Kansas soils and subsoils showed that they contained from 0·01 to 0·11% of barium. Other soils were examined spectroscopically.

Barium was also found in various plants collected in different parts of Nebraska, Colorado, and Kansas (compare *Bureau of Plants, Ind. Bull.* 129). N. H. J. M.

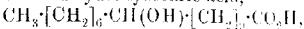
Studies in Soil Oxidation. OSWALD SCHREINER, MICHAEL X. SULLIVAN and F. R. REID (*U.S. Dept. Agric. Bur. Soils Bull.* 73, 1910).—Oxidation in soils is, in part, due to the action of roots and partly to processes, mainly non-enzymatic, in the soil itself. Oxidation in soils is increased by the presence of salts of manganese; iron, aluminium, calcium, and magnesium, especially in conjunction with hydroxy-acids (citric, tartaric, malic, and glycollic acids) and their salts, the greatest effect being obtained with manganese, and the stimulating effect of manganese is attributed to this increased oxidation rather than to any direct action on the plant. Manurial salts increase the oxidising power of roots, whilst their action on the oxidising processes in the soil itself is variable. Excessive oxidation is injurious to vegetation. N. H. J. M.

Pentosans in Soils. EDMUND C. SHOREY and ELBERT C. LATHEP (*J. Amer. Chem. Soc.*, 1910, **32**, 1680—1683).—Estimations of the pentosans in ten soils of widely different character have been made by boiling the soils with hydrochloric acid and weighing the furfuraldehyde produced in the form of its phloroglucinol compound. The results show that the amounts of pentosans in these soils ranged from 0·027 to 2·750%, whilst the proportion of carbon in the form of pentosans to the total carbon in the soils varied between 1·30 and 28·3%. The soil which contained the largest quantity of pentosan (2·75%) was a Marshall loam taken from a field in North Dakota on which flax had been grown for several years. From this soil, a crude pentosan was obtained which, when heated with hydrochloric acid, yielded furfuraldehyde, and on digestion with sulphuric acid furnished a pentose which was identified as xylose. Tests for other pentoses gave negative results.

It is pointed out that the method employed for estimating pentosans is merely an estimation of the furfuraldehyde which may originate from a pentosan, a pentose, or a pentose-yielding material other than a pentosan. The pentosans or pentose-yielding material in soils must be regarded either as plant residues, such as a portion of the lignocellulose which has resisted decomposition, or as products of the decomposition of complex compounds, such as nucleoproteins. E. G.

Some Acid Constituents of Soil Humus. OSWALD SCHREINER and EDMUND C. SHOREY (*J. Amer. Chem. Soc.*, 1910, **32**, 1674-1680).—The authors have already isolated certain acid substances from the soil, namely, dihydroxystearic, 2-picoline 4-carboxylic, and agroceric acids (Abstr., 1908, ii, 421, 889, 1067; *Bull. 53, Bureau of Soils, U.S. Dept. Agric.*, 1909).

The study of the acid constituents of soil humus has been continued, and α -hydroxystearic, paraffinic, and lignoceric acids have now been isolated. The so-called α -hydroxystearic acid,



m. p. 84-85°, and the dihydroxystearic acid described previously are probably produced in the soil by the action of micro-organisms on organic matter of vegetable or animal origin. The paraffinic acid, $\text{C}_{24}\text{H}_{48}\text{O}_2$, is identical with that obtained by Ponchet (Abstr., 1875, 50), by the action of fuming nitric acid on paraffin. The manner in which this substance is formed in the soil is not clear, but it is probably produced by the oxidation of solid hydrocarbons, such as are known to occur in plant tissues. Lignoceric acid, $\text{C}_{24}\text{H}_{46}\text{O}_2$ (Hell and Hermanns, Abstr., 1881, 249), occurs as a glyceride in groundnut oil, and may possibly be a constituent of other vegetable oils; its production in the soil may be due to the decomposition of such glycerides. This acid is also obtained by the distillation of wood, and it is therefore possible that its occurrence in the soil may be the result of the decomposition of woody tissues by the agency of micro-organisms. E. G.

Chemical Nature of Soil Organic Matter. OSWALD SCHREINER and EDMUND C. SHOREY (*U.S. Dept. Agric. Bur. Soils Bull.*, **74**, 1910).—In addition to the four substances previously obtained from soils [dihydroxystearic acid, picolinecarboxylic acid, agroceric acid, and igrosterol], the following compounds have now been isolated: hepticosane, α -hydroxystearic acid, paraffinic acid, lignoceric acid, phytosterol, pentosan, histidine, arginine, cytosine, xanthine, hypoxanthine, fatty glycerides, and several resin acids. N. H. J. M.

Manurial Value of Manganese Sulphate. A. CARLIER (*Biol. Zent.*, 1910, **39**, 859; from *Ann. Gembloux*, 1910, 423).—Manganese sulphate applied to grass at the rate of 50 and 100 kilos. per hectare increased the yield of hay 0·9 and 9·5% respectively.

The same amounts of manganese sulphate reduced the yield of potatoes by 9 and 0·6%. The yield of mangolds (roots) was reduced by 2·5 and 1%, and the leaf of mangolds by 25 and 20%. N. H. J. M.

Analytical Chemistry.

Preparation of a Sensitive and Stable Litmus Solution. F. PÜSCHEL (*Oesterr. Chem. Zeit.*, 1910, [ii], **13**, 185-186).—The positive violet-coloured constituent of litmus can be separated from the other colouring matters and gums present in the commercial

product by heating with dilute sulphuric acid (about 4%), when it is precipitated presumably in the form of a sulphonate acid; this, after collection and washing, is redissolved in hot water and neutralised with sodium hydroxide, when an exceedingly sensitive violet solution is obtained.

F. M. G. M.

The Colouring Matter of Red Radishes. JULIUS F. SACHER (*Chem. Zeit.*, 1910, 34, 1333).—Further particulars as to the colouring matter of red radishes and its applications in titrations (*Abstr.*, 1910, ii, 1106).

In aqueous solutions alkali carbonates behave like hydroxides. In dilute alcoholic solutions, however, the case is different. If, for instance, to 1 c.c. of the alcoholic solution of the indicator is added a small crystal of sodium carbonate and then water drop by drop, a solution is at first obtained which in incident light is of an emerald-green, and in transmitted light of a red, colour. On shaking, the liquid looks bluish-green. With gas light, it is wine-red in any direction. On adding more water, the liquid turns violet, then blue, and after about half an hour the colour changes to green and finally to yellow. It has been remarked that the indicator is too unstable to be of use in practice, but the author states that it keeps unchanged in alcoholic solution; moreover, it may be prepared fresh in a few minutes. L. DE K.

Use of Sulphur Dioxide in Checking Strengths of Volumetric Solutions of Iodine, Alkali, and Silver. ELIAS ELVOYE (*Amer. J. Pharm.*, 1911, 83, 19—23).—A scheme is outlined for basing the determination of the strengths of volumetric solutions on pure silver as a standard. The solutions would be prepared in the following order, each serving as a standard for the succeeding one: ammonium thiocyanate (standardised against pure silver), silver nitrate, hydrochloric acid, sodium hydroxide, oxalic acid, potassium permanganate, sodium thiosulphate, iodine. To control the standardisation, 25 c.c. of the standard iodine solution should be just decolorised by freshly prepared sulphur dioxide solution and the acid formed titrated with the standard sodium hydroxide solution. The total iodine in this neutralised solution could then be determined by adding excess of silver nitrate and titrating the excess of silver with standard ammonium thiocyanate, allowance being made for the pure potassium iodide used in preparing the iodine solution. T. A. H.

Rapid Estimations and Separations by means of a Mercury Cathode and Stationary Anode. RAYMOND C. BENNER and M. L. HARTMANN (*J. Amer. Chem. Soc.*, 1910, 32, 1628—1636).—It has been shown (Stoddard, *Abstr.*, 1909, ii, 347; Benner, *Abstr.*, 1910, ii, 999) that electro-analysis can be carried out with a mercury cathode and stationary platinum gauze anode, sufficient agitation being produced by the evolution of gas to enable the metal to be deposited in an adherent form.

Comparisons have now been made of the rates of precipitation, under similar conditions, which show that although the rate is greater with the rotating anode than with the stationary anode, it is not sufficiently

so to justify the use of the much more complicated apparatus. The results obtained with the stationary anode are as accurate as those obtained by other mercury cathode methods, and it has been found that the estimation and separation of various metals can be effected under the same conditions as are employed with the rotating anode.

E. G.

A New Apparatus for Effecting Slow and Certain Incineration. EDMOND J. APS (*Chem. Zeit.*, 1910, 34, 1374).—The vessel in which the ignition is carried out is supported on three prongs attached to a vertical axis, which is slowly rotated by means of a motor.

By this means, it is claimed that uniform heating is obtained and spattering prevented.

F. B.

Gas-Volumetric Estimation of Hydrogen. OTTO BRUNCK (*Chem. Zeit.*, 1910, 34, 1313—1314; 1331—1332).—After a short reference to the various methods for estimating hydrogen, the remainder of the paper is occupied by a description of Paal and Hartmann's method, which makes use of colloidal palladium (compare *Abstr.*, 1910, ii, 237).

T. S. P.

Gas Analysis by Toepler's Pressure Balance. ERNST MOHR (*J. pr. Chem.*, 1910, [ii], 540—546. Compare Toepler, *Abstr.*, 1896, ii, 235).—An apparatus is described for the measurement of the small amount of hydrogen in technical electrolytic oxygen. Two similar vertical glass tubes of the same height and open at the upper ends are connected by their lower ends to a bent tube, containing a thread of petroleum, the two limbs of which are very slightly inclined to the horizontal plane. One tube is filled with the gas under examination, the other with pure dry oxygen; in consequence of the small difference in density of the two gases, the thread of petroleum is shifted from its null position, the amount of the displacement being read by an optical micrometer. An equation is given by which the desired percentage of hydrogen can be calculated. The constant of the apparatus is determined by using gaseous mixtures of known composition. About 0·02% of hydrogen can be estimated rapidly and with sufficient accuracy.

C. S.

Estimation of the Acidity of Hydrogen Peroxide. LOTHAR WOHLER and W. FREY (*Zeitsch. angew. Chem.*, 1910, 23, 2353—2354).—The acidity of hydrogen peroxide can be accurately determined by direct titration with N/10-alkali. Methyl-orange should be used as indicator when the acid present allows of it, since its indications are quite sharp, even with a 30% solution of hydrogen peroxide. When the acid present necessitates the use of phenolphthalein as indicator, it is best to destroy the hydrogen peroxide with platinum-black or by warming with excess of alkali, before the acidity is determined, taking great care to exclude carbon dioxide. Endemann's results (*Abstr.*, 1909, ii, 432) are due to the fact that carbon dioxide was not excluded, so that correct results could not be obtained with phenolphthalein as indicator.

T. S. P.

Estimation of Chlorides in Blood. BERTHOLD OPPLER (*Zeitsch. physiol. Chem.*, 1910, 70, 198—204).—The removal of protein by phosphotungstic acid gives good results in the estimation of sugar, but not of chlorides in such fluids as blood. Metaphosphoric acid is for chlorides the best substance to use for getting rid of the protein. The chlorine may be estimated gravimetrically as silver chloride, or electrolytically.

W. D. H.

Estimation of Iodine in Alcoholic Solutions. G. FAURE (*Ann. Chim. anal.*, 1911, 16, 12—13).—The author has tried the gravimetric process recommended by Desvignes (weighing as silver iodide after conversion into potassium iodide) and the volumetric process recommended by Lebeau for aqueous solutions (titration with silver nitrate after treatment with zinc powder), and finds both processes to give the same result as the titration with thiosulphate.

When applying Lebeau's process to tinctures, it is advisable to neutralise any free acid present by means of a little zinc carbonate. Both processes have the advantage over the thiosulphate method that they are applicable to alcoholic solutions which have been kept for a long time, and in which hydriodic acid may be present. L. de K.

Estimation of Sulphur in Brass and Bronze.—GUSTAV THURNHAUER (*J. Ind. Engin. Chem.*, 1910, 2, 293).—The author recommends the following process adapted from organic analytical procedure for estimating sulphur in brass and bronze; it gives excellent results, and avoids the tedious operations of oxidising with aqua regia and subsequently removing metals.

One gram of bronze filings is thoroughly mixed with six grams of a mixture consisting of potassium chlorate (2 parts) and sodium carbonate (1 part), transferred to a wrought-iron crucible (lined with a layer of sodium carbonate), and covered with a further quantity of the mixture. The crucible is gradually heated until the mass is completely fused; after cooling, the fusion is digested with hot water and the metallic oxides are removed by filtration, the solution acidified with hydrochloric acid, and the sulphur estimated in the usual manner as barium sulphate. It great accuracy is required, a silver crucible should be employed, but the amount of sulphur abstracted from the iron does not usually introduce an error exceeding 0·01 per cent.

F. M. G. M.

Red Coloration given by Esbach's Reagent [with Crine]. C. GAZZETTI and C. SARTI (*Arch. farm. sperim. Sci.*, 1910, 9, 319—325).—A pathological urine was found to give a ruby-red coloration with Esbach's reagent. The colour was due to picramic acid, formed from the picric acid by ammonia and ammonium sulphide present in the urine. It was also produced on addition of picric acid alone, and, in fact, is destroyed by excess of citric acid. Since the amount of ammonium sulphide present was scarcely to be detected with lead test-papers, it appears that this reaction is very delicate. R. V. S.

A New Apparatus for the Quantitative Estimation of Sulphur Trioxide in Sulphuric Acid. GEORGE FINCH (*Zeitsch. Schiess und Sprungstoffwesen*, 1910, 5, 167—168).—The apparatus

consists of a flask, to the lower bulb portion of which is attached a narrow tube bent at a convenient angle, through which the liquid to be analysed is introduced by suction; this can be closed by an accurately fitting capsule. The neck of the flask may be closed with a stopper, or by a dropping funnel which is connected below its tap with a U tube, the other arm of which is open to the atmosphere.

The required amount of fuming acid is drawn into the tared flask and weighed, the neck stopper is then replaced by the dropping funnel, and the U-tube at its side half filled with water; the acid is then diluted with distilled water by means of the dropping funnel (the stem of which is drawn out into a capillary), made up to a convenient volume, and titrated with sodium hydroxide.

F. M. G. M.

Gravimetric Estimation of Tellurium and Alkalimetric Estimation of Telluric Acid. ARTHUR ROSENHEIM and M. WEINHEBER (*Zeitsch. anorg. Chem.*, 1911, 69, 266-269).—When the estimation of tellurium by reduction with hydrazine in weakly alkaline solutions is carried out according to Guthrie's instructions (Abstr., 1901, ii, 687), the results are not trustworthy, some tellurium often remaining unprecipitated, or else some of it is oxidised in the drying. The authors recommend that the tellurium solution be reduced with a 10% hydrazine sulphate solution while contained in a covered beaker in an autoclave heated to 130° under 3-4 atmospheres' pressure. The tellurium is then deposited completely in half-an-hour, and in such a form that it does not oxidise during the subsequent treatment.

Telluric acid, when mixed with glycerol in aqueous solution, behaves as a monobasic acid towards phenolphthalein, but the results are somewhat variable. Better volumetric results are obtained as follows: To the solution of telluric acid is added a large excess of N/10-barium hydroxide or of N/10-sodium hydroxide containing barium chloride. In consequence of the excess of barium ions, the precipitation of the telluric acid as barium tellurate, BaTeO_4 , is complete. The excess of hydroxide can then be determined by titration with oxalic acid, using phenolphthalein as indicator, without it being necessary to first collect the precipitate. In this process telluric acid acts as a dibasic acid.

T. S. P.

Estimation of Free Ammonia and Ammonium Carbonate by Titration. JOHN C. THOMLINSON (*Chem. News*, 1911, 103, 13).—The author states that this may be effected as follows: The liquid is titrated into N-sulphuric acid, using phenolphthalein as indicator, until the liquid assumes a transient pink colour through its entire bulk; this gives the normal ammonium carbonate. Methyl orange is then added, and the titration is continued; this gives the total ammonia.

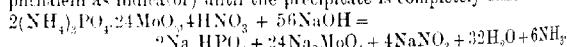
L. DE R.

Detection and Estimation of Nitric Acid in Milk by means of the Diphenylamine-Sulphuric Acid Test. J. TILLMANS (*Zeitsch. Nahr. Genussm.*, 1910, 20, 676-707).—The results of an investigation of this test are given, the chief object being to ascertain the conditions under which the test is capable of detecting very small amounts of

nitric acid in milk, as the presence of nitric acid indicates that water containing nitrates has been added to the milk. The milk is first treated with calcium chloride, and the serum thus obtained is shaken with ether and calcium hydroxide in order to remove certain proteins and lactose. A portion, 0·5 c.c., of the clear solution obtained is then mixed with 2 c.c. of the reagent, cooled, and placed aside for a hour; the blue coloration produced if nitric acid is present reaches its full intensity after this lapse of time. The reagent is prepared by mixing 0·085 gram of diphenylamine with 190 c.c. of dilute sulphuric acid (1 : 3), and adding a quantity of concentrated sulphuric acid; the mixture becomes heated, and the diphenylamine dissolves. Concentrated sulphuric acid is now added to make the volume of the whole nearly 500 c.c., the mixture is cooled, and finally made up to a volume of 500 c.c. by the addition of concentrated acid. It is essential that chlorides be present in the solution to be tested; water containing a large amount of nitrates, but free from chlorides, does not yield a coloration with the reagent. Water containing 0·1 mg. of nitric acid (N_2O_5) per litre, and milk serum with 0·25 mg. per litre, yield distinct colorations. In the absence of nitric acid, milk serum gives a yellow or pink coloration. By comparing the coloration obtained with those yielded, under similar conditions, by portions of milk serum containing known quantities of nitric acid, it is possible to estimate the amount of nitric acid in the milk from which the serum was prepared. Nitrous acid also yields a blue coloration with the reagent; in this case the presence of chlorides is not essential, and the coloration develops almost at once. Milk containing an abnormal quantity of dirt may give a reaction for nitric acid, but the small amounts of foreign matters usually present in milk do not cause the production of a coloration.

W. P. S.

Estimation of Phosphoric Acid in Soils and Crops. HERMANN KASERER and IGNAZ K. GREISENEGGER (*Zeitsch. landw. Vers.-wezen Oesterr.*, 1910, 13, 795).—The methods advocated for the analysis of organic material by Neumann (*Hoppe-Seyler's Handbuch der Physiologischen und pathologisch-chemischen Analyse*) are discussed, and some modifications suggested. For the estimation of phosphoric acid, the author advises that a measured portion of the liquid from the "Kjeldahl" flask be treated with excess of ammonium nitrate, ammonium molybdate added, the mixture thoroughly agitated, and rapidly cooled. The precipitate is collected in an asbestos-lined Gooch crucible, washed with water and alcohol, and the whole transferred into a beaker and titrated with $N/4$ -sodium hydroxide (employing phenolphthalein as indicator) until the precipitate is completely dissolved:



The red liquid is then boiled until all ammonia is evolved (more sodium hydroxide being added as required), excess of standard sulphuric acid added and any carbon dioxide removed by boiling, and the hot solution then finally titrated back with alkali. A table of comparative results with those obtained by Neumann's method is given in the paper.

F. M. G. M.

Easy Detection of Arsenic; Rapid Separation of Arsenic and Some Other Metals from Liquids. ERNST SALKOWSKI (*Zeitsch. physiol. Chem.*, 1910, 70, 186—188. Compare Carlson, *Abstr.*, 1910, ii, 938).—Attention is drawn to the fact that it has been known for a long time that the addition of ether or chloroform to an aqueous colloidal solution produces a precipitation of the colloid. Arsenious sulphide is not dissolved by either ether or chloroform, but the use of ether for precipitating is preferable, as the separation of the sulphide can be effected more readily than when chloroform is used.

J. J. S.

Convenient Potash Bulb. C. E. WATERS (*J. Amer. Chem. Soc.*, 1910, 32, 1691—1693).—The apparatus consists of an inner tube terminating in either a bulb or disc, pierced by a number of small holes to break the gas up into small bubbles, and an outer, larger tube or bulb, which is sealed to the inner tube at the top. From the shoulder of the large bulb pass two tubes, one for the exit of the gas and the other for the admission of the potassium hydroxide solution; the latter is furnished with a ground glass stopper. Between the inner and outer tubes are a number of annular glass discs which fit so loosely that they can move freely up and down between projections blown on the wall of the inner tube. The gas, after passing through the inner tube, rises in the outer tube, and is trapped successively by the discs, which alternately rise and fall, thereby wetting the wall of the outer tube with fresh solution. The free spaces between the discs and the walls of the tubes should not be less than 1 mm. wide. The volume of solution in the bulb is usually sufficient if it just reaches the second disc.

This apparatus is less fragile and much lighter than Geissler's bulb, and by means of the special stoppered tube for filling, all danger of contact between the solution and the rubber connexions is obviated.

E. G.

Detection and Estimation of Potassium Perchlorate in Potassium Chlorate. K. SCHERINGA (*Pharm. Weekblad*, 1911, 48, 15).—The new method is based on the fact that potassium perchlorate is not reduced by sulphur dioxide. One gram of a sample of potassium chlorate is dissolved in 130 c.c. of water in an Erlenmeyer flask plugged with cotton wool. A current of sulphur dioxide, generated by heating a solution of 15 grams of sodium sulphite with 3 c.c. of sulphuric acid, is passed just above the solution; the sulphur dioxide is rapidly absorbed, and causes reduction of the chlorate to chloride. After boiling for some time, a solution of 1.5 gram of silver nitrate is added, and the silver chloride is collected and weighed as usual.

The filtrate, which contains the perchlorate, is made alkaline with sodium carbonate, and, after filtering off from the silver oxide, it is evaporated to a very small bulk, introduced into a test-tube, boiled until solidification sets in, and then dried completely in an air-bath. After plugging the tube with asbestos, the mass is heated to redness for some time, and the asbestos layer is then also heated for a while.

The chlorine in the mass, which represents the perchlorate, is then estimated as usual.

Potassium perchlorate free from chlorate does not reduce indigo solution.

L. DE K.

Character of Silver Deposits from Various Electrolytes. JOSIAH SIMPSON HUGHES and JAMES R. WITHROW (*J. Amer. Chem. Soc.*, 1910, **32**, 1571—1576).—Experiments are described which include the repetition of some of the earlier work on the electrolytic estimation of silver, and a series of trials with electrolytes which have not been used previously.

In the case of the nitric acid electrolyte, it was found that dense deposits could not be obtained if the *E.M.F.* was high, but that, with a low *E.M.F.*, good crystalline deposits were produced; this is in accord with the statement of Küster and von Steinwehr (*Abstr.*, 1899, **ii**, 125). With an electrolyte of ammonium sulphate and ammonium hydroxide, bright deposits were often obtained at first, but became more velvet-like as their weight increased, and darkened when the *E.M.F.* was over 1·4 volts; in all cases, the weights of the deposits were too high unless the *E.M.F.* was kept below 1·4 volts. When ammonium sulphate was used in the absence of ammonium hydroxide, a heavy, black, graphite-like deposit was formed on the anode, but disappeared on the addition of a few drops of ammonium hydroxide. With electrolytes consisting of ammoniacal solutions of ammonium phosphate and pyrophosphate, crystalline deposits were produced, but were spongy if the *E.M.F.* was too high. Potassium cyanide gave good, white deposits, especially at a temperature of 60—70°.

The other electrolytes studied were sulphuric acid, sulphuric acid and glycerol, ammonium thiocyanate, sodium hydroxide and ammonium hydroxide, ammonium perchlorate, potassium fluoride, and hydrofluosilicic acid. The deposits from sulphuric acid and glycerol were coarsely crystalline and non-adherent. Hydrofluosilicic acid gave satisfactory results.

In the case of each of these electrolytes, except potassium cyanide, there is a point at about 1·4 volts above which spongy deposits are produced; with potassium cyanide, the point is much higher.

E. G.

Estimation of Minimum Quantities of Calcium in Presence of a Large Excess of Magnesium. CH. LIESSE (*Ann. Chim. anal.*, 1911, **16**, 7—8).—The sample is dissolved in twenty-five parts of hydrochloric acid, one hundred parts of water are added, and the solution is neutralised with ammonia, using phenolphthalein as indicator. The precipitate (silica, alumina, iron oxide) is removed by filtration, and water is added up to 1500 c.c. for each gram of sample. Four grams (or more) of solid ammonium oxalate are introduced, and the solution is acidified with acetic acid. After waiting for two hours with occasional stirring, the calcium oxalate is collected and treated as usual. Owing to the large dilution, it is free from magnesium oxalate. L. DE K.

New Test Paper for the Volumetric Estimation of Zinc [with Sodium Sulphide]. R. KOPENHAGUE (*Ann. Chim. anal.*, 1911, 16, 10—12).—As external indicator is used a strip of filter-paper impregnated with a 10% solution of cadmium nitrate and dried at 89—90°.

A small drop of the solution deposited on the paper will, in a few seconds, turn yellow if sufficient sodium sulphide has been added.

L. DE K.

Rapid Estimation of Lead in Ores by Electrolysis with Stationary Electrodes. R. C. BENNER (*J. Inst. Engin. Chem.*, 1910, 2, 348—349).—The work of Sand was repeated and his results confirmed, showing that it is possible to deposit all the lead which can occur in a 0·5 gram sample of ore in five to ten minutes; for the electrolysis, 75 c.c. of the solution, in the presence of 20 c.c. of nitric acid (0·1·1), are used with a current of 4·8 amperes and 2·5 volts; the electrolyte is warmed during the deposition so as to maintain the cell just below boiling point.

About 0·5—1 gram of pulverised ore was freed from sulphide by boiling with hydrochloric acid, but not concentrated to the point where lead chloride would crystallise out; the hydrochloric acid was then expelled with concentrated nitric acid, and the volume of the solution reduced to about 10 c.c., diluted to 75 c.c., and electrolysed as above.

In ores where this method was impossible, aqua regia was employed, and the solution evaporated until fumes of sulphur trioxide became apparent, water added, and the basic iron sulphate dissolved by boiling; the lead sulphate was then collected, and converted into lead carbonate by treatment with hot ammonium carbonate; this was collected, washed, redissolved in nitric acid, and the lead finally deposited by electrolysis.

F. M. G. M.

Quantitative Analysis of German Silver and Similar Alloys. REINHOLD KORTE (*Zeitsch. angew. Chem.*, 1910, 23, 2354—2356).—The author recommends the following methods of analysis: To determine the copper, nickel, and zinc, about 0·8 gram of the alloy is dissolved in aqua regia, the solution evaporated to dryness, and the residue taken up with hydrochloric acid and water. The copper is precipitated with hydrogen sulphide, the copper sulphide collected, dissolved in nitric acid, and the copper determined electrolytically. The filtrate from the copper sulphide is concentrated to about 50 c.c., a hot solution of 2 grams of dicyanodiamidine sulphate in 20 c.c. of water added, cooled, and then made alkaline with ammonia. A 30% solution of potassium hydroxide is then added until the blue colour changes to yellow: on remaining overnight, the nickel dicyanodiamidine sulphate has completely precipitated. It is washed by decantation with ammonia water, dissolved in dilute sulphuric acid, and the nickel determined electrolytically after the addition of ammonium sulphate and ammonium hydroxide; or the precipitate may be collected in a Gooch crucible, dried at 115°, and weighed directly, but in this case it is necessary to add a little tartaric acid to the solution before precipitating, in order to retain the iron in solution.

The filtrate from the nickel precipitate is acidified with hydrochloric acid, made up to 500 c.c., and the zinc in 100 c.c. determined by direct titration with potassium ferrocyanide, using ammonium molybdate as indicator.

To determine iron and manganese, the latter is precipitated as peroxide from a nitric acid solution of 2 grams of the alloy by heating with potassium chlorate. The collected and washed manganese peroxide is dissolved in hot concentrated hydrochloric acid, the diluted solution made ammoniacal, and the manganese again precipitated as peroxide by boiling with ammonium persulphate; it is weighed as Mn_3O_4 .

The iron in the filtrate is precipitated by ammonium hydroxide, after the addition of solid ammonium chloride, the ferric hydroxide collected, and dissolved in hydrochloric acid. After the addition of 150 c.c. of warm water and a few drops of a 5% solution of copper chloride in hydrochloric acid, together with 15—20 c.c. of a 10% solution of sodium salicylate, the deep violet solution is titrated with a standard solution of sodium thiosulphate until colourless; this gives the percentage of iron.

The author recommends this method for estimating iron as being quite as trustworthy as titration with permanganate; it is only necessary to exclude nitric acid, or a large excess of hydrochloric acid.

T. S. P.

Separation of Iron, Chromium, and Aluminium. TCHARVIANI and WUNDER (*Ann. Chim. anal.*, 1911, 16, 1—7).—*Separation of Iron and Chromium.*—About 0·5 gram of the mixed oxides is fused in a platinum crucible with 6 grams of sodium carbonate over a Tech burner for three hours with free access of air. The fused mass is boiled with water, and the residual iron oxide subjected to a second fusion to remove the last traces of chromium. As iron oxide always retains alkali, it must be purified by solution in hot dilute hydrochloric acid and reprecipitation with ammonia. The chromium is recovered as oxide from the alkali chromate solution in the usual manner; it should be purified by solution in hydrochloric acid and reprecipitation with ammonia.

Separation of Chromium and Aluminium.—The fusion should be continued for about six hours. The aqueous solution is then heated with excess of ammonium nitrate until the free ammonia has been expelled. The alumina is thus obtained in a pure condition. The filtrate is acidified with nitric acid, reduced by addition of alcohol, and the chrome oxide is precipitated with ammonia.

Separation of Iron and Aluminium.—A double fusion is required, and both iron and aluminium are then estimated as just directed.

Separation of Iron, Chromium, and Aluminium.—A seven hours' fusion is required; although this suffices for a complete disintegration, a second fusion is perhaps advisable. The fused mass is then treated as previously directed.

L. DE K.

Analysis of Chromium Tungsten-Steel. F. WILLY HINRICHSEN and TH. DIECKMANN (*Mitt. K. Materialprüfungsamt Gross-Lichterfelde West.*, 1919, 28, 229—246. Compare *Abstr.*, 1908, ii, 900).—A comparative

discussion on the different methods employed by the author and others for the estimation of chromium, tungsten, and phosphoric acid in steels. Knorre's method of precipitating tungsten with benzidine (Abstr., 1905, ii, 286; 1908, ii, 231, 779) is considered fairly satisfactory, the employment of tartaric and tannic acids and hydroxylamine is likewise discussed.

F. M. G. M.

Estimation of Chromium in Chrome-Tungsten Steel.
 HENRIK WADOWSZEWSKI [with P. BOGOLIUBOFF] (*Chem. Zeit.*, 1910, 34, 1365).—A modification of von Knorre's method (Abstr., 1908, ii, 779). One to two grams of steel borings are placed into a 500 c.c. Erlenmeyer flask, 10–15 c.c. of 15% solution of sodium hydrogen phosphate are added, and then 8–16 c.c. of sulphuric acid (D 1·65) and 5 c.c. of water. The metal dissolves with the aid of a gentle heat in about fifteen minutes, and, after heating a little more strongly, 2 c.c. of nitric acid (D 1·4) are added, which converts the tungsten into soluble phosphotungstic acid. The clear liquid is then diluted with 300–500 c.c. of hot water, 3–5 grams of ammonium persulphate are added to oxidise the chromium to chromic acid, and the excess of the reagent is then destroyed by boiling. After adding a few more c.c. of sulphuric acid, the chromic acid is titrated with standard ferrous ammonium sulphate, the excess of which is titrated with standard permanganate.

L. DE K.

The Analysis of Ferro-Uranium. WOLDEMAR TRAUTMANN (*Zeitsch. angew. Chem.*, 1911, 24, 61–62).—The powdered alloy (0·4 to 0·6 gram) is dissolved in warm aqua regia, three hours' warming being sufficient even when much carbon and silicon are present. After diluting with water and cooling, an excess of solid ammonium carbonate is added, and the solution is repeatedly stirred. After twenty-four hours, the precipitate, containing the whole of the iron and aluminium, and the silica, is collected. The filtrate is boiled, precipitating most of the uranium. The addition of a few drops of ammonia precipitates the remainder, and the precipitate is then collected, washed with ammonium nitrate, and weighed as U_3O_8 .

Carbon is estimated by direct combustion in oxygen, and silicon by the usual method. Aluminium may be estimated by fusion with sodium peroxide, precipitation of alumina and silica by ammonia, and separation by means of hydrofluoric acid, or by fusion with potassium hydrogen sulphate.

C. B. D.

The Analysis of Ferro-Zirconium. WOLDEMAR TRAUTMANN (*Zeitsch. angew. Chem.*, 1911, 24, 62).—The alloys, which contain less than 20% of zirconium, may be roasted in a platinum crucible, fused with sodium carbonate and a little nitrate, dissolved in water with the aid of a little hydrochloric acid, and repeatedly evaporated to dryness with hydrochloric acid. The silica is estimated in the usual way, and is then tested for purity by fusion with potassium hydrogen sulphate. It retains from 1·2 to 2·9% of the zirconium present. The zirconium is best estimated by boiling the approximately neutral filtrate with sodium thiosulphate, fusing the ignited precipitate with potassium

hydrogen sulphate, and repeating the precipitation. If aluminium is present in the alloy, it passes into the zirconia, and must be removed by fusion with sodium peroxide.

The alloy may also be dissolved, after roasting, in hydrofluoric acid, the zirconium being estimated by any of the usual methods. Carbon is estimated by combustion in oxygen. C. H. D.

A New Reagent for Nickel and Cobalt and its Use for Distinguishing between these Metals. H. WEIL (*Bull. Soc. chim.*, 1911, [iv], 9, 20—22).—The process depends essentially on the difference in solubility of the basic chromates of the two metals in water.

Potassium chromate gives with cold neutral aqueous solutions of cobalt salts, containing not less than 2 grams per litre, a reddish-brown precipitate of the basic chromate, $\text{CoCrO}_4 \cdot \text{CoO}$; aq. With very dilute solutions the precipitate only appears on boiling, and in this way 0·000032 gram of cobalt may be detected. The precipitate is soluble in acid or ammonia, and is decomposed by alkali hydroxides.

Nickel gives under the same conditions a chocolate-brown precipitate, $\text{NiCrO}_4 \cdot 2\text{NiO}$, which forms very slowly in the cold, even in concentrated solutions, but rapidly on boiling. A precipitate is formed with 0·000028 gram of nickel.

For use in distinguishing between the two metals when present in nearly equal quantities, the cobalt is precipitated in the cold, and the nickel on boiling the filtrate, both being recognised by the colour of the respective precipitates. If nickel is present in small amount relatively to cobalt, the precipitate obtained on boiling the filtrate, which may contain some cobalt, is washed, dissolved in dilute ammonia solution, and the liquid freed from ammonia by evaporation, when chocolate brown basic nickel chromate is precipitated, whilst cobalt under these conditions gives a green precipitate. If nickel is present in great excess, cobalt is no longer precipitated in the cold, and the deposit obtained on boiling must then be treated with ammonia as described, when the formation of a green precipitate indicates the presence of cobalt. T. A. H.

Analysis of Tin Alloys. FRANZ KETREIBER (*Oesterr. Chem. Zeit.*, 1910, [ii], 13, 185—186).—Alloys containing tin, antimony, lead, and copper (such as Britannia metal and type metal) can be conveniently analysed as follows. About 1 gram of the alloy after heating with moderately concentrated nitric acid (10—15 c.c.) until all action has ceased is transferred to a basin and evaporated down with about 25 grams of pure crystalline sodium sulphide ($\text{Na}_2\text{S} \cdot 9\text{H}_2\text{O}$), and the temperature subsequently raised until the melt begins to harden; it is then digested with hot water, whereby the tin and antimony are dissolved and the lead and copper remain insoluble; the former are then separated as described by Panatow (Abstr., 1909, ii, 523). F. M. G. M.

A New Method of Analysing White Metal. E. SCHÜRMANN (*Mitt. K. Materialprüfungsamt Gross-Lichterfelde West.*, 1910, 28, 34, 350).—Alloys containing possibly tin, antimony, copper, arsenic,

lead, and mercury, and can be conveniently analysed by converting the metals into their bromides. The alloy is carefully treated with a solution of bromine in chloroform or carbon tetrachloride, and, on warming, a violent reaction takes place; when this is ended, the mixture is thoroughly shaken with an aqueous solution of oxalic acid, separated, and the insoluble bromides and stannic acid collected. The antimony is precipitated from the solution with hydrogen sulphide, and the remaining tin subsequently by electrolysis.

E. M. G. M.

Estimation of Glycerol. W. STEINFELS (*Seifenseife Zeit.*, 1910, 37, 793—795).—The author discusses the various methods advocated for the estimation of glycerol, and suggests some modifications to the one introduced by Hehner. The alkaline liquid containing glycerol (not more than 2 grams) is acidified with sulphuric acid, rendered feebly alkaline with sodium hydroxide, and treated with 20 c.c. of 10% zinc sulphate solution; it is then filtered, and made up to 250 c.c.; 25 c.c. of this are oxidised by heating on the water-bath for two hours with 25 c.c. of Hehner's potassium dichromate solution and 50 c.c. of dilute sulphuric acid (1 : 4). After cooling, it is diluted to 500 c.c. with cold water. Twenty-five c.c. are run into a $\frac{3}{4}$ litre flask containing 2 grams of potassium iodide, dissolved in the least possible amount of water and 10 c.c. of hydrochloric acid (1 : 2), diluted to 1 litre, and titrated with sodium thiosulphate.

E. M. G. M.

Colorimetric Estimation of Dextrose in Urine. WILHELM AUTENRIETH and THEODOR TESDORFF (*Münch. med. Woch.*, 1910, 37, No. 34, Reprint 13 pp.).—The authors find that the end-point in the titration of urinary dextrose by Bang's method (Abstr., 1907, ii, 136) is not sharp, and, moreover, is dependent on various factors, such as temperature, concentration, and rapidity of working. Better results may be obtained by employing an excess of Bang's copper solution, and estimating the unaltered copper with the help of the colorimeter previously described (Autenrieth and Königberger, Abstr., 1910, ii, 910). The copper solution changes slightly when kept or when boiled, but the accuracy of the results is not affected if the same duration of ebullition (three minutes) is always employed. A curve is prepared showing the amounts of dextrose corresponding with the scale divisions of the colorimeter.

The agitation with blood-charcoal suggested by Bang and Behmannsson (Abstr., 1910, ii, 163) for the removal from urine of reducing substances other than dextrose is not to be recommended, because the charcoal absorbs dextrose as well. Loss of dextrose also occurs when the agitation with charcoal is effected in presence of hydrochloric acid.

R. V. S.

The Micro-Chemistry of Inulin. O. TUNMANN (*Ber. Deut. pharm. Ges.*, 1910, 20, 577—585).—The so-called amorphous inulin granules in cellular tissues are not of a uniform nature; inulin crystals occur in them, and these crystals are bound together by other substances. The most useful reactions for detecting inulin are given by pyrogallol and

resorcinol-hydrochloric acid (0·1 gram of resorcinol dissolved in 5 c.c. of alcohol and 5 c.c. of hydrochloric acid); the former yields a violet-red coloration on warming for a short time, and the latter a red coloration. Before applying the test, the preparation should be immersed for eight days in alcohol containing tartaric acid to remove alkaloids, then for eight weeks in alcohol to harden the inulin, and, finally, be washed with water to remove sugars. The membrane of the cells and starch do not give a coloration with the reagents.

W. P. S.

A New Mode of Estimating Pentosans by the Copper Reduction Method. J. TH. FLOHL (*Chem. Weekblad*, 1910, 7, 1057—1063).—The amount of furfuraldehyde generated by boiling pentosans with dilute hydrochloric acid can be estimated by its reducing action on Fehling's solution, the cuprous oxide being weighed, or the excess of cupric salt ascertained by iodometry. The procedure is to prepare 400 c.c. of the furfuraldehyde distillate, add to add sodium hydroxide (1:3) to 50 c.c. of the cooled distillate until the reaction is slightly alkaline. To the mixture are added 10 c.c. of a solution containing 69·28 grams of crystallised copper sulphate per litre, and 10 c.c. of one containing 346 grams of Rochelle salt and 100 grams of sodium hydroxide per litre. After diluting the solution to 100 c.c. with distilled water, it is boiled in a reflux apparatus for thirty-five minutes, pieces of ice being placed in the open end of the condenser to ensure complete condensation of the furfuraldehyde. When the operation is finished, the liquid is cooled quickly, and the extent of the oxidation is ascertained by the gravimetric or volumetric method. Each c.c. of $N/10$ -sodium thiosulphate corresponds with 0·0024 gram of furfuraldehyde, and each mg. of copper with 0·0003775 gram. The percentage of pentosan can be calculated by means of Tollens's formula. The amount of reduction of the Febling's solution in the absence of furfuraldehyde must be ascertained by the aid of a blank experiment carried out with similar conditions, and deducted from the analytical results before calculating the percentage of furfuraldehyde.

A. J. W.

Estimation of Lactic Acid. ELIAS ELVOVE (*Amer. J. Pharm.* 1911, 83, 14—19).—The United States Pharmacopœia specifies a lactic acid containing 75% of true lactic acid and having D^{25} 1·206. An acid of this specific gravity should contain about 85% of true lactic acid, and this anomalous specification is due to the inaccuracy of the pharmacopœial method of estimation, which involves direct titration of the boiling acid. The author recommends instead the addition of 50 c.c. of normal sodium hydroxide solution to 2 grams of the acid, and titration of the excess of alkali with normal sulphuric acid after the mixture has remained for thirty minutes in the cold. Phenolphthalein should be used as indicator.

T. A. H.

The Anhydride of Lactic Acid. A. A. BESSON (*Chem. Zeit.* 1911, 35, 26).—Attention is drawn to the fact that specimens of lactic acid frequently contain quantities of the anhydride, and that the latter is not estimated when the acidity of a sample is determined

by direct titration. The total amount of acid is found by treating the neutralised solution with an excess of alkali, leaving the mixture for ten minutes, then adding an excess of acid, boiling the solution, and neutralising. The quantity of alkali used in these operations is a measure of the total lactic acid present (that is, acid *plus* anhydride) in the sample. In cases where dextrin has been removed from the sample by treatment with alcohol and the alcoholic solution of the acid evaporated before the titration, it is necessary to collect the distillate and titrate its acidity, as a small quantity of the acid distils over with the alcohol.

W. P. S.

Influence of Potassium Dichromate on Certain Analytical Constants of Milk. LEON GARNIER (*J. Pharm. Chim.*, 1911, [vii], 3, 55—59).—Samples of milk collected officially in France in connexion with the food adulteration law of 1905 are ordered to be preserved by the addition of 1 gram of potassium dichromate per litre. The author points out that in analysing milk so treated, allowance must be made for the increase in specific gravity, acidity, refraction, "dry extract," and ash, due to the addition. He also finds that milk preserved by means of dichromate, when kept, increases steadily in acidity and refraction and decreases in optical activity, these changes being no doubt in part due to conversion of lactose into lactic acid. The changes induced are irregular in amount, but the variations are usually within limits narrow enough to permit of corrections being made in analytical results.

T. A. H.

Simple Method for the Estimation of Formaldehyde. FELIX HERRMANN (*Chem. Zeit.*, 1911, 35, 25—26).—The formaldehyde solution is mixed with ammonium chloride and treated with a definite volume of standard sodium hydroxide solution; the ammonia liberated combines with the formaldehyde to form hexamethylenetetramine, and the excess of alkali is then titrated. The difference between the quantity of alkali added and that found by titration represents the amount of ammonia which has combined with the formaldehyde and is a measure of the quantity of the latter present. A correction must be made for the amount of free acid which is always present in commercial formaldehyde solutions.

W. P. S.

Estimation of Cyanogen Compounds in Coke Oven Gases. EMILE LECOCQ (*Bull. Soc. chim. Belg.*, 1910, 24, 439—445).—Fifty to 100 litres of the gas are passed through absorption tubes containing 2·5 grams of lead acetate dissolved in 200 c.c. of a 10% potassium hydroxide solution. The precipitated lead sulphide is removed by filtration, and the filtrate transferred to a 500 c.c. flask; the lead is then precipitated by addition of dilute sulphuric acid, the solution being cooled during the process to prevent the escape of hydrogen cyanide. After making up to the mark, 400 c.c. of the clear solution are removed for the estimation of cyanide and thiocyanate.

For this purpose, 10 c.c. of a solution containing 10% of a mixture of equal parts of ferrous and ferric sulphates are added, followed by potassium hydroxide solution sufficient to precipitate a considerable

proportion of the iron in solution. After about an hour, the contents of the flask are acidified by addition of sulphuric acid, heated on the water-bath for a quarter of an hour, and left for some hours. The reddish-coloured solution is then decanted off, and the Prussian-blue separated by filtration through a small, fine-grained filter-paper. The proportion of cyanide in the precipitate is now estimated by Fehl's method, which consists in converting the complex cyanide into mercuric cyanide by heating with an alkaline solution of magnesium and mercuric chlorides.

For the estimation of the thiocyanate, the decanted solution and the wash liquors are combined, made up to a definite volume, and the colour of the solution compared with that of a similar solution containing a known quantity of thiocyanate.

Actual experimental results are recorded, according to which the average amount of cyanogen is 0.093 gram, and that of thiocyanogen 0.189 gram, per cubic metre of gas.

H. M. D.

Estimation of Cyanamide, Dicyanodiamide, and Carbamide in Calcium Cyanamide (Kalkstickstoff). NIKODEM CARO [with R. SENTZER] (*Ztsch. angew. Chem.*, 1910, **23**, 2407—2411).—See this vol. i. 119.

Tests for Cocaine and Certain other Anaesthetics. ERNEST H. HANKIN (*Analyst*, 1911, **35**, 2—6).—The permanganate test for cocaine is extremely sensitive if the cocaine is dissolved in alum solution and the permanganate is used in the form of a dried film; the test readily distinguishes between cocaine and certain cocaine substitutes. Of these substitutes, alypine, tropacocaine, and scopolamine form crystalline permanganates which can easily be distinguished from each other and from cocaine permanganate. β -Eucaine, stovaine, novocaine, horecaine, and nirvane do not form crystalline permanganates, but bromine-water furnishes a means of distinguishing them. With bromine-water, cocaine, scopolamine, stovaine, and novocaine give a yellow precipitate which dissolves on heating; β -eucaine yields a precipitate which dissolves on warming, but is reprecipitated on boiling the solution. Nirvane also gives a yellow precipitate, soluble on heating the solution; the liquid acquires a red colour. Horecaine yields a yellow precipitate with bromine-water; when the mixture is boiled, the precipitate dissolves, and a pinkish-white opalescence is produced in the liquid.

W. P. S.

New Reaction of Cuprene. GEORGES DENIGIS (*Compt. rend.*, 1910, **151**, 1354—1355).—Compare this vol. ii. 79).—Ten c.c. of a solution of a cuprene salt (about 0.2%) is mixed with 1 c.c. of ammonia and 1 c.c. of 1 vol. hydrogen peroxide. After shaking, 0.1 c.c. of copper sulphate solution, containing 3—4% of the crystalline salt, is added, and the mixture again shaken. The liquid becomes green, and shows greenish-blue particles in suspension; an absorption band is visible in the infra-red. On the addition of an equal volume of alcohol to the solution, it changes to deep emerald green. The reaction is visible in solutions considerably more dilute than the one mentioned.

W. O. W.

Estimation of Morphine. RUDOLF GOTTLIEB and O. STEPPHN (*Arch. exp. Path. Pharm.*, 1910, **64**, 54—66. Compare Abstr., 1910, ii, 558).—Rübsamen's method is defended, and details given of the method and of the sources of error and how to avoid them. W. D. II.

Estimation of Nicotine in Concentrated Tobacco Juice. JOHANNES SCHRÖDER (*Chem. Zeit.*, 1911, **35**, 30).—Very varying results are obtained by the processes which have been proposed by different workers (Kissling, Heut, Keller, Biel, Schloesing, Tóth, etc.) for the estimation of nicotine in tobacco, although fairly concordant figures are yielded by each particular method. The discrepancy is particularly marked in the case of products containing considerable quantities of nicotine, such, for instance, as the concentrated tobacco extracts which are used as insecticides. The method described by Tóth has been recommended as being trustworthy for technical purposes, but the author points out that the results obtained for one sample may vary by as much as 20% of the quantity of nicotine actually present. He considers that the subject needs further investigation.

W. P. S.

Volumetric Estimation of Phenolphthalein. V. ZOTIER (*Bull. Soc. chim.*, 1910, [iv], **7**, 993—995).—A weighed quantity of the material containing phenolphthalein is triturated with sodium hydroxide, free from carbonate and mixed with a few c.c. of water, and the solution made up to 50 c.c. and filtered. To 25 c.c. of the filtrate, dilute hydrochloric acid is added until phenolphthalein begins to be precipitated, any precipitate formed being then just redissolved by a drop or two of *N*/10-sodium hydroxide. *N*/10-Sulphuric acid is then added until the red colour disappears, the liquid being vigorously shaken after each addition of acid. If *n* be the quantity in c.c. of *N*/10-acid added, and *V* the volume of the liquid after titration, the quantity in centigrams of phenolphthalein in the material used is given by the formula: $2[1.59n + (V - n)0.0092]$. It is convenient to use the second 25 c.c. of filtrate as a control.

T. A. H.

Estimation of the Tannin in Tanning Liquids by means of the Zeiss Immersion Refractometer. PIETRO FALCIOLA and M. CORRIDI (*Gazzetta*, 1910, **40**, ii, 229—236).—The change of refractive index caused by removal of the tanning substance from the solutions is compared with the weight of tanning substance precipitated, and in this way the amount of the latter corresponding with one-scale division of the refractometer is ascertained. The results agree fairly closely with those of Zwick (*Chem. Zeit.*, 1908, **32**, 405) and Sager (*Collegium*, 1909, 146), and indicate that the refractometric equivalents for tanning substances of different origins do not differ more than those for different samples of the same origin, so that it would not seem possible to identify the source of a given extract by this means, as was suggested by Zwick.

R. V. S.

Estimation of the Amide Nitrogen in Proteins. W. DENIS (*J. Biol. Chem.*, 1910, **8**, 427—435).—Folin's method for the estima-

tion of ammonia in urine can also be used with good results for the estimation of ammonia in the cleavage products of proteins; amino-acids are not affected.

W. D. H.

Method for the Estimation of the Aliphatic Amino-group. Application to the Chemistry of the Proteins, Urine, and Enzymes. DONALD D. VAN SLYKE (*Ber.*, 1910, 43, 3170—3181).—The apparatus described, in which the principle of Sachs and Kormann is adopted, allows of the determination of aliphatic amino-groups within a few minutes, with an accuracy of ± 1.20 mg. of nitrogen. A flask containing 35—37 c.c. is nearly filled with a mixture of sodium nitrite and acetic acid, and closed with a cork through which pass capillary tubes closed by stopcocks connecting with a gas burette, a tube containing the amino-acid solution, and a tube containing water. The air is entirely displaced from the flask by nitric oxide, and about 20 c.c. of solution are driven back into the tube containing water by the pressure of the gas formed. The flask is then connected to the burette, and the amino-acid run in. Nitrogen is evolved, and passes together with much nitric oxide into the burette. After about five minutes, all the gas is expelled from the flask by running in water, and the mixture of gases collected is passed into an absorption pipette containing alkaline potassium permanganate. The residual nitrogen is measured. A few drops of amyl alcohol are introduced when protein solutions, which are inclined to froth, are analysed.

The simple amino acids give up all their nitrogen. Arginine, histidine, and tryptophan give up one molecule of nitrogen. In leucyl-leucine the peptide amino-group does not react; this group is partly active in glycylglycine. Cytosine and guanine react only slowly with the primary amino-groups. Proline and oxyproline do not react.

By determining the total and amine nitrogen in an impure proline fraction, the amount of this present is accurately obtained; thus casein contains 6.7% proline.

It is possible almost completely to analyse a protein, even when only small amounts are available, by hydrolysis and determination of the nitrogen as ammonia, melanine nitrogen, total and total amino-nitrogen, and also of the total and amino-nitrogen in the phosphotungstic acid precipitate and filtrate. The method is applicable to urine after removal of the carbamide and ammonium; 1.5 to 2.5% of the total nitrogen is urine in amino-nitrogen.

By taking proofs from time to time, it is possible to follow the course of protein hydrolysis by trypsin or by sodium hydroxide. The amino-acid nitrogen increases as hydrolysis proceeds.

E. F. A.

General and Physical Chemistry.

Character of the Double Refraction of Liquid Crystals.
 DANIEL VORLÄNDER and M. E. HURN (*Zeitsch. physikal. Chem.*, 1911, 75, 641—650. Compare Abstr., 1908, ii, 88).—Further evidence has been obtained of the rule already enunciated, that all liquid crystals are optically uniaxial. Pleochroism, surface colours, and iridescence of liquid crystals are only observed with substances showing circular polarisation, but crystals showing no pleochroism or play of colours may be optically active. All liquid crystals showing pleochroism and iridescence show negative double refraction; all other crystals show positive double refraction. The latter rule also applies to crystals which exist in more than one liquid-crystalline phase. In such a case, the region of the phases showing pleochroism and iridescence occurs regularly between those of the amorphous liquid and of the colourless, crystalline liquid.

G. S.

The Variation of the Refractive Index with the Temperature in the Ultra-red Region for Rock Salt, Sylvine, and Fluorite. ERIK ZIEBREICH (*Ber. Deut. physikal. Ges.*, 1911, 13, 1—18).—Measurements of the variation of the refractive index with the temperature have been made for wave-lengths extending to $\lambda = 6.5\mu$ in the case of fluorite and to $\lambda = 9\mu$ and 21μ for rock salt and sylvine. The temperature-coefficients are negative, a result which is identical with that obtained for rays of the visible spectrum. In contrast with the behaviour of visible rays, the temperature-coefficient for the ultra-red rays diminishes as the wave-length increases. This difference is attributed to a shift of the region of absorption in the direction of greater wave-lengths as the temperature is raised.

H. M. D.

Structure of Liquids with Conical Focal Lines. GEORGES THIÉDEL and F. GRANDJEAN (*Compt. rend.*, 1911, 152, 322—325. Compare Abstr., 1910, ii, 809, 1018).—Contrary to the view upheld in a previous paper, the author now agrees with Mauguin (*Compt. rend.*, 1910, 151, 1141) that liquids such as azoxyphenetole are doubly refractive throughout their whole mass and optically homogeneous. This is not evident from the appearance of a film of the substance in polarised light, unless the utmost precautions are taken to ensure the purity of the compound, the cleanliness of the glass plates between which it is viewed, and their freedom from relative movement. The geometrical nature of the phenomena observed when these precautions are taken is discussed.

W. O. W.

Optical Dispersion : An Analysis of its Actual Dependence on Physical Conditions. T. H. HAVELOCK (*Proc. Roy. Soc.*, 1911, 84, 492—523).—The effect of the physical state of a medium on its optical dispersion can be represented by means of two variables, one of which is the density (ρ), and the other a factor (σ) which expresses

the effect of surrounding molecules. For two different states of aggregation of the same substance, it is found that the difference, $\rho_2/(n_2^2 - 1) - \rho_1/(n_1^2 - 1) = \rho_1\sigma_2 - \rho_2\sigma_1$, is independent of the wave-length of the rays passing through the substance, and is a function only of physical conditions, such as pressure, temperature, and density. Experimental data for gases and liquids are shown to be in satisfactory agreement with this deduction. By assigning a zero value to σ in the case of a gas at 0° and 760 mm., numerical values can be obtained which express the effect of the molecular aggregation in different states. Anomalies in the refractivity are to be ascribed, in part, to variations in the magnitude of the factor σ . H. M. D.

The Doppler Spectrum of the Hydrogen Canal Rays. E. GEHRCKE and O. REICHENHEIM (*Ber. Deut. physikal. Ges.*, 1911, 13, 111–118).—The Doppler effect exhibited by the line H_β in the canal-ray spectrum of hydrogen has been investigated. For a given fall of the cathode potential, the distribution of intensity in the Doppler spectrum is dependent on the size of the cathode. With a cathode of 1.5 mm. diameter, the intensity of the two Doppler lines is approximately the same when the cathode fall amounts to 730–800 volts. The sharpness of the Doppler lines increases as the pressure of the hydrogen in the discharge tube diminishes. From the observations at higher pressures it is found that the wave-lengths of the Doppler lines do not correspond with velocities of particles in the ratio of $\sqrt{2} : 1$, and this is considered to be irreconcilable with the hypothesis that the lines are due to hydrogen atoms and hydrogen molecules respectively under the influence of the same driving force. H. M. D.

Normals from the Arc Spectrum of Ion in the International System. HEINRICH KAYSER (*Zeitsch. wiss. Photochem.*, 1911, 9, 173–185).—To supplement the determinations of the normal lines of the second order, measurements have been made of further lines in the arc spectrum of iron of wave-lengths differing by 5–10 Å. These normal lines of the third order were obtained by means of a concave grating having 20,000 lines to the inch, and a radius of curvature of 6.5 metres. The measurements extend from $\lambda = 4120$ to $\lambda = 6495$. The recorded wave-lengths were obtained by an interpolation method in which the data for several pairs of adjacent secondary normal lines were made use of, and the several interpolated values were then combined to give a mean value.

On comparison of the differences between the corresponding wave-length numbers in Rowland's and the international system, it is found these increase from about 0.16 at $\lambda = 4100$ to about 0.21 at $\lambda = 6500$. H. M. D.

Absorption Spectra of Certain Salts of Cobalt, Erbium, Neodymium, and Uranium as Affected by Temperature and by Chemical Reagents. I. and II. HARRY C. JONES and W. W. STRONG (*Amer. Chem. J.*, 1911, 45, 1–36, 113–159).—The work of Jones and Anderson (Abstr., 1909, ii, 359) on the absorption spectra of cobalt, erbium, and neodymium salts has been continued.

I. Solutions of cobalt chloride and bromide in glycerol do not give

any of the fine red cobalt bands. A rise of temperature of the more concentrated solutions causes the yellow absorption band at $\lambda 5100$ to widen, so as finally to absorb all the red, and thus cause the solution to appear blue. Concentrated aqueous solutions of cobalt chloride show an enormous increase in the absorption with rise of temperature; this increase takes place at lower temperatures as the concentration is increased. In the case of the more dilute solutions, the widening of the absorption with rise of temperature is quite symmetrical. The effect of a rise of temperature on the absorption of cobalt nitrate or sulphate is very small, as compared with its effect on the chloride. The presence of calcium or aluminium chloride in aqueous solutions of cobalt chloride increases the effect of temperature on the absorption, and causes the red absorption to take place in more dilute solutions. The temperature at which the absorption in the red increases so greatly is termed the "critical colour temperature," and seems to depend on the existence of some solvate or peculiar condition of the cobalt molecule; it is much higher in water and glycerol than in other solvents.

A review is given of Becquerel's investigations of the effect of low temperatures and magnetic fields on the absorption spectra of erbium and neodymium.

The absorption in solutions of erbium chloride in glycerol is very similar to that in aqueous solutions, but the bands, in general, are shifted towards the red, and most of them are of greater wave-length than those of aqueous solutions. A rise of temperature from 15° to 200° produces no appreciable change in wave-length, but at the higher temperature the bands are much less distinct and considerably weaker. An examination of the spectra of aqueous solutions of erbium nitrate has shown that the NO_3^- group does not exert a hypsochromous effect such as has been found for the uranyl bands.

It has been found that Beer's law holds for solutions of neodymium salts in glycerol, except in the case of the more dilute solutions, which show greater general absorption in the ultra-violet. A rise of temperature of a solution of neodymium chloride in glycerol effects scarcely any noticeable shift in the bands. The presence of calcium chloride causes the temperature shift of the bands to be increased, but the effect is not so great as in aqueous solutions. The absorption spectra of neodymium chloride in glycerol are very similar to those of aqueous solutions. The "glycerol" bands closely resemble the "water" bands, but are all of slightly greater wave-length. The presence of free nitric acid in aqueous solutions of the nitrate causes the bands to become much broader and more diffuse than those of the neutral salt. A study has been made of the effect of nitric acid, hydrobromic acid, and hydrochloric acid on neodymium acetate solutions, and of hydrochloric acid on neodymium citrate solutions. The spectra indicate that in some of these reactions there probably exist several systems of compounds between the acetate and the salt of the acid added.

An investigation of concentrated solutions of erbium and neodymium salts and of the salts themselves has shown that the spectra are entirely different for the different salts. It has also been found that the absorption of different salts in the same solvent is very similar,

which indicates that the solvent plays an important part in the absorption of light.

II. It is unusual for the absorption spectra of solutions of salts to show much, if any, influence of the acid radicle, but an exception exists in the case of aqueous solutions of uranium salts, the uranyl nitrate bands being all of shorter wave-length than those of other uranyl salts.

The absorption spectra of the uranyl salts have been photographed over a wide range of concentration, and the results show that the wave-lengths of the bands do not depend on the concentration.

Experiments have been made on the influence of nitric acid on the absorption spectra of uranyl nitrate, of sulphuric acid on those of the sulphate, of acetic acid on those of the acetate, and of hydrochloric acid, calcium chloride or aluminium chloride on those of the chloride. In general, the presence of these reagents causes the uranyl bands to become more intense, and, in some cases, narrower. The action of all the reagents, except nitric acid, is to cause the uranyl bands to be shifted towards the red. Nitric acid, however, causes a considerable shift towards the violet. Similar effects are produced on the bands of the corresponding uranous salts. These effects are probably due to the formation of aggregates.

A study has also been made of the effect of gradually adding sulphuric or hydrochloric acid to uranyl nitrate, and it has been found that the spectra change gradually as one salt is transformed into the other (compare Abstr., 1910, ii, 247).

It has been shown previously (Abstr., 1909, ii, 360) that the spectrum of any one salt often varies greatly with different solvents. Uranoous salts have been found to show very characteristic bands in water, methyl and ethyl alcohols, acetone, and glycerol. In mixtures of two solvents, both sets of solvent bands appear, the intensity of any solvent band being a function of the relative amounts of the solvents present.

A rise of temperature causes the general absorption of an aqueous solution of any salt to increase, and also causes the bands to become wider and more intense. The uranyl chloride bands are shifted towards the red as the temperature increases, but those of uranyl nitrate do not appear to shift. Uranyl nitrate, dissolved in concentrated nitric acid, however, shows a considerable shift. The bands of uranyl acetate and sulphate are only slightly shifted.

It is pointed out that the results of this investigation furnish additional evidence that ions and certain molecules combine to some extent with the solvent. These so-called solvates have very different compositions and absorption spectra, depending on the solvent employed for the solution of a particular salt.

The paper concludes with a discussion of the bearing of the solvate hypothesis on the theory of electrolytic dissociation (compare Abstr., 1909, ii, 221; and *Zeitsch. physikal. Chem.*, 1910, 74, 325). A bibliography of the work of Jones and others on this subject is appended.

E. G.

Selective Oxidation. XXXIII. HARRY C. JONES and W. W. STRONG (*Amer. Chem. J.*, 1911, 45, 36-38).—The absorption spectrum

of a solution of uranous bromide in a mixture of methyl alcohol and water shows two well-defined sets of bands, the "methyl alcohol bands" and the "water bands." On adding a small quantity of potassium perchlorate to such a solution, the uranous "water bands" disappear, whilst the "methyl alcohol bands" remain, thus showing that the portion of the uranous salt combined with the water has been oxidised, whilst that combined with the methyl alcohol has not undergone any change. Calcium nitrate produces the same effect, but hydrogen peroxide oxidises both the "hydrated" and "alcoholated" uranous bromide to the uranyl state. Similar results are obtained with uranous chloride.

E. G.

The Destruction of the Fluorescence of Iodine and Bromine Vapour by other Gases. ROBERT W. WOOD (*Ber. Deut. physikal. Ges.*, 1911, 13, 72—77 *).—The intensity of the fluorescent light which is emitted by iodine vapour when subjected to sunlight decreases when foreign gases are admixed with the vapour. From a series of comparative measurements it has been found that the fluorescence is diminished in the ratio 5·3 to 1 by ethyl ether, carbon dioxide, air, and hydrogen when the pressures of the admixed gases are respectively 3, 7, 11·5, and 24 mm. The influence of the foreign gas increases with its molecular weight, but there is no simple connexion between the two quantities.

In the absence of traces of foreign gases, the intensity of the fluorescence of iodine increases in a linear manner with the temperature between -20° and $+20^{\circ}$. At 30° the intensity is the same as at 20° , but diminishes with further rise of temperature. It is probable that at the higher temperatures the increase in the fluorescence is more than counterbalanced by the increased absorption.

Some experiments with bromine vapour show that this can be made to fluoresce if the tube containing it is cooled by means of solid carbon dioxide. This indicates that the density of the vapour must be reduced below a certain value before the molecules of the vapour show fluorescent effects.

H. M. D.

The Influence on the Fluorescence of Iodine and Mercury Vapour of Gases with Different Affinities for Electrons. J. FRANCK and ROBERT W. WOOD (*Ber. Deut. physikal. Ges.*, 1911, 13, 78—83 †).—The effect of varying quantities of helium, argon, nitrogen, oxygen, and chlorine on the intensity of the fluorescence of iodine vapour has been examined. On comparing the results with those obtained in presence of hydrogen, air, carbon dioxide, and ethyl ether (see preceding abstract), it is found that the reduction in the intensity of the fluorescence for a given pressure of the admixed gas increases as the electro-negative character becomes more pronounced. The inert gases are least active, whilst chlorine is the most effective. Preliminary experiments with mercury vapour in presence of helium and oxygen have given similar results. In presence of oxygen at a pressure of 3 mm., mercury cannot be made to fluoresce,

* *and Phil. Mag.*, 1911, [vi], 21, 309—313.† *and Phil. Mag.*, 1911, [vi], 21, 314—318.

whereas helium at a pressure of one atmosphere is apparently without influence.

These observations are connected with the fact that the pressures at which fluorescence can be excited in the case of mercury, iodine, and bromine are very different. The optimum pressure for mercury amounts to several atmospheres; for iodine it is 0·2 mm., and for bromine it is very small. The fall in pressure with increase in the electro-negative character of the vapour is supposed to be due to the increasing influence of the vibrating molecules on one another.

H. M. D.

The Transformation of the Resonance Spectrum of Fluorescing Iodine into a Banded Spectrum by Addition of Helium. ROBERT W. WOOD and J. FRANCK (*Ber. Deut. physikal. Ges.*, 1911, 13, 84—87; also *Phil. Mag.*, 1911, [vi], 21, 265—268. Compare preceding abstracts).—Spectroscopic examination of the fluorescent light emitted by iodine vapour exposed to the green mercury line has shown that the presence of helium at a pressure of 2 mm. of mercury causes a marked change in the spectrum. The series of lines which are observed in pure iodine vapour are greatly diminished in intensity, and this change is accompanied by the appearance of a banded spectrum. This spectrum appears to be identical with that which is obtained when the iodine vapour (without helium) is excited by means of white light. When the pressure of the helium is raised to 10 mm., the series of resonance lines can no longer be observed. When the helium is replaced by chlorine, there is no trace of this banded spectrum.

In explanation of these observations it is supposed that impacts of iodine molecules with molecules of helium set up vibrations in all the contained systems of electrons, the energy of the original vibrating systems being thereby diminished. The change in the colour of the fluorescence from green to red when increasing quantities of helium are admixed with the iodine vapour is consistent with this hypothesis. The absence of the banded spectrum in presence of chlorine is due to the damping effect of the strongly electro-negative molecules.

H. M. D.

Photolysis of Acids with a Complex Grouping by Ultra-violet Light. Action of Uranium Salts as Luminous Catalysts. DANIEL BERTHELOT and HENRY GAUDECHON (*Compt. rend.*, 1911, 152, 262—265. Compare Abstr., 1910, i, 349, 543; ii, 564, 606, 813, 814).—Dibasic acids in the solid state or in aqueous solution lose carbon dioxide on exposure to ultra-violet light, and form monobasic acids, which, on prolonged exposure, undergo further decomposition as previously indicated. Maleic and fumaric acids give a mixture of carbon monoxide and dioxide. Pyruvic acid is decomposed in the same way as by heat, but levulinic acid behaves differently, yielding carbon dioxide, carbon monoxide, and gaseous hydrocarbons. Lactic acid forms mainly carbon dioxide, with carbon monoxide, hydrogen, and methane.

The action of the rays on the foregoing substances is accelerated by the presence of uranium salts, which act as catalysts. Other fluorescent

substances, such as thorium sulphate or eosin, are without action. The presence of fluorescent substances diminishes the decomposition of simple compounds, such as alcohol or acetaldehyde. W. O. W.

The Re-combination of Ions Produced in Gases by α -Rays. M. MOULIN (*Le Radium*, 1910, 7, 350—354).—Curves are given showing the relation between the ionisation current and voltage for carbon dioxide, air, and hydrogen ionised by the α -rays of polonium when the electric field acts in the direction of, at right angles to, and at 45° to, the path of the rays through the gas. It is possible to predict the form of saturation curve for different inclinations of the electric field to the trajectories of the rays by supposing that only the component of the field perpendicular to the trajectories acts. This would not be the case if the phenomenon of lack of saturation with α -ray ionisation were due to initial re-combination of ions produced from the same molecule, but is well explained on the view that the ions are formed in columns along the trajectory of the rays, and are not uniformly distributed throughout the volume of the gas.

F. S.

The Different Influences of α , β , and γ -Rays on the Colours of Solid Substances. CORNELIO DOELTER and HEINRICH SIRK (*Monatsh.*, 1910, 31, 1057—1066).—Rock salt, quartz, fluorspar, and barytes were exposed for four months to the α -rays of polonium deposited on a platinum foil. Only the first-named showed coloration, which was brownish, and extended only some hundredths of a millimetre into the material. A glass vessel in which a radium preparation had been kept showed, in addition to the brown coloration throughout due to β -rays, an intense surface coloration due to α -rays. Glass cubes exposed to the β - and γ -rays of radium showed an intense dark brown coloration, diminishing with depth, due to β -rays, and a much lighter uniform yellowish-brown coloration beyond, due to the γ -rays.

A cylinder of salmon-red gold-ruby-glass, covered on all sides but one with 5 mm. thickness of tin foil and exposed to two radium preparations consisting of 1·0 and 0·5 gram of radium chloride, one acting directly and the other through the foil, showed after twenty-three days a uniform orange-brown colour, showing that the β -rays were without action in this case.

A clear rock-crystal after exposure to the rays showed a remarkable distribution of colour, reminiscent of what is often seen in natural amethysts, consisting of lighter and darker shades of colour parallel to the hexagonal contour. From the centre extended three rhomb-shaped streaks parallel to the crystal axes. The darker streaks were all dichroic. There was no alteration of the rotatory power or of the interference figure of the crystal. Coloured zircons are coloured more deeply, and those rendered colourless by heating are re-coloured by the rays. Solutions of barium and calcium chloride were not coloured by thirty days' exposure to the rays from 0·5 gram of radium chloride, but those of mercuric chloride, potassium chloride, and sodium sulphate showed respectively faint yellowish, milky-blue, and yellow coloration, as is the case for the solid salts.

F. S.

Scattering During Radioactive Recoil. WALTER MAKOWER and SYDNEY RUSS (*Mem. Manchester Phil. Soc.*, 1910, 55, No. 2, 1-4).—In experiments on the recoil in a vacuum of radium-*B* from a wire coated with radium-*A*, surfaces out of the direct line-of-fire also received some active deposit. Under conditions where the surface could only receive active deposit by reflexion from an opposite surface, the decay curve showed that more than one-half of the active matter deposited was radium-*C*, and not radium-*B*. The latter is probably due to reflexion and the former to recoil from radium-*B* deposited on the reflector. The large proportion of radium-*C* under these conditions is surprising, as in ordinary circumstances only one-thousandth of the atoms of radium-*C* formed recoil from radium-*B*. It is probable that the absence of films on the surface in this experiment is the cause of the greater proportion of the radium-*C* recoiling. F. S.

The Chemical Reactions of Radioactive Elements. BÉLA SZILARD (*Le Radium*, 1910, 7, 366-372).—The views that the fixation of radioactive elements by precipitates formed in their solutions is due to chemical similarity between the precipitant and the substance fixed, or to the great insolubility of the radioactive substance, the precipitant acting as a nucleus, or to the electro-positive character of the elements, like barium, most used as precipitants, or to isomorphism, or to the lowering of the solubility of the radio-element by addition of another electrolyte, are dismissed as untenable. The view is advanced that the precipitates are charged particles in suspension which attract the charged ions of the dissolved radio-element, forming complexes less highly charged.

Precipitates like barium sulphate and ferric hydroxide, formed in non-radioactive solutions and afterwards mixed with them, still fix the radioactive substance. The precipitates most useful, as barium sulphate, carbon, &c., are extremely insoluble substances, capable of existing undissolved in the state of fine suspensions. Whether radioactive substances act differently in neutralising the charge on these fine particles from ordinary electrolytes cannot at the present time be decided. F. S.

Some Probable Chemical Properties of Radium and its Compounds. ROBERT DE FORCRAND (*Compt. rend.*, 1911, 152, 66-69).—The heats of solution and of formation, respectively, augment or diminish regularly for the halogen salts and the oxides of the alkali and alkaline earth metals, in the order: calcium, lithium, strontium, barium, sodium, potassium, rubidium, cesium. So far as is known, the same is true for the sulphates and selenates, and for the hydrides and carbides. The affinity of the oxides for oxygen, water, or carbon dioxide, and the solubility of the fluorides, oxides, and, with some irregularities, the carbonates augment progressively in the order given. Similar considerations apply to the solubility in alcohol or in hydrochloric acid of most of the halides and carbonates and to the formation from the fluorides of more and more stable compounds with hydrofluoric acid. In this scheme radium, by analogy, is to be placed between barium and sodium, and by taking the mean of the values for these elements, the heat of formation of the

halogen salts and oxide, in solution, can be approximately calculated for radium ($\frac{1}{2}\text{Ra}$) as follow : chloride, 98·5; bromide, 91·0; iodide, 79·0; fluoride, 112·0; oxide, 79·6 Cal. The solubilities at 15° per 100 parts of water, calculated in the same way, are : chloride, 35 to 36; bromide, 100; iodide, 180; fluoride, 1 to 2; oxide, 10 to 20. The calculated heat of reaction between radium ($\frac{1}{2}\text{Ra}$) and excess of water is 45 Cal. The hydroxide should be more stable than that of barium, and less stable than sodium hydroxide. The oxide should be peroxidised easily at a red heat with development of 19 Cal., and the carbonate should be formed from the oxide with 70 Cal., and should be with difficulty decomposed at a red heat. The heat of formation of the hydride ($\frac{1}{2}\text{Ra}$) should be 17·7 Cal., and it should decompose at about 900°. It is to be expected that the metal should be formed by the action of calcium or lithium on the fluoride, or by calcium or aluminium on the oxide.

F. S.

The Density of Niton (Radium Emanation) and the Disintegration Theory. R. WHITLAW GRAY and Sir WILLIAM RAMSAY (*Proc. Roy. Soc.*, 1911, **A**, 84, 536—550).—By means of a modified form of the micro-balance described by Steele and Grant (Abstr., 1909, ii, 876) the authors have succeeded in determining the density of niton from experiments with about 0·1 cubic mm. of the gas weighing approximately 1/1400 mg. The balance employed was sensitive to about $2 \cdot 10^{-6}$ mg., and its zero was found to remain constant for days together. As in Steele and Grant's balance, a small silica tube containing air was used as counterpoise, its capacity being about 20 cubic mm. Instead of weighing by displacement from the zero position, a null method was adopted, the pressure in the balance being altered until the spot of light reflected from a platinised silica mirror, and deflected by movement of the beam, was brought back to its initial position.

The volume of niton at disposal, representing the equilibrium amount yielded by the available radium, was known from previous experiments, and the proportion of this actually present in the weighing tube was ascertained by measurements of the γ -ray activity. In five independent experiments, the values obtained for the density of niton corresponded with molecular weight values of 227, 226, 225, 220, and 218, mean = 223.

After the lapse of sufficient time for the decay of the niton and the conversion of its quick-change products, *A*, *B*, *C*, into radium-*D*, the density tube was opened, and the loss of weight corresponding with the helium produced was determined. After correction, this diminution in weight was found to correspond with the loss of three atoms of helium from each atom of niton. Since four atoms of helium are emitted by an atom of radium during its conversion into radium-*D*, and the atomic weight of radium is 226·4, it follows that the true atomic weight of niton is 222·4.

H. M. D.

The Half Period of Actinium-*C*. ALOIS F. KOVÁČIK (*Physikal. Zeitsch.*, 1911, **12**, 83).—The period of decay of actinium-*C* obtained by recoil methods has been frequently measured. From 150 curves

the mean value of the half-period, 4·71 minutes, was found, no single value being so great as five minutes. Hahn and Meitner found by several methods the value 5·1 minutes (compare *Abstr.*, 1908, ii, 920).

F. S.

Radioactive Equilibrium in Vesuvian Cotunnite. PAOLO ROSSI (*Atti R. Accad. Lincei*, 1910, [v], 19, ii, 578—583. Compare *Abstr.*, 1908, ii, 9; and Zambonini, *Abstr.*, 1907, ii, 663).—From theoretical considerations the author deduces what measurements are necessary for ascertaining whether a given specimen of cotunnite (containing radium-*D*, radium-*E*, and radium-*F*) has reached radioactive equilibrium. The question may be settled either by examining the radioactivity of the specimen at intervals of a few months, or by comparing its activity with that of a sample known to be in equilibrium. For the latter purpose the author has employed a cotunnite dating from 1872, and has found that the sample of the mineral of 1907, examined by Zambonini (*loc. cit.*), was by no means in equilibrium, and contained in fact at that time very little radium-*F*. It had attained to an equilibrium condition by July, 1910. In this connexion interest attaches to the observation of Pintti (*Rend. Acad. Sci. fis. mat. Napoli*, 1910, [iii], 16, 30), who found no helium in the mineral, and suggested that possibly this disintegration product of radium-*F* had not had time to accumulate.

R. V. S.

The Radioactivity of Rocks. ALBERT GOCKEL (*Jahrb. Radioaktiv. Elektronik*, 1910, 7, 487—527).—The α -radioactivity, and in some cases the β -activity also, of a great variety of rocks and minerals from all parts of the world has been examined. The radioactivity was found to vary within far wider limits than when determined by means of the emanation method. Igneous rocks may be divided into three classes. The first is strongly radioactive, and comprises granite, porphyry, syenite, and pegmatite, the activity being due to zircon, rutile, titanite, and rare earths. The second class, comprising diabase, andesite, and gabbro, are almost inactive. The third class, comprising the remainder, are of intermediate activity. The activity of the first class varies over a range of 1 to 280, due to variation in the amount of active constituent minerals. Among sedimentary rocks, quartz sand, rock salt, gypsum, anhydrite, and chalk are inactive, the activity of the others averaging only one-tenth of that of the first group of igneous rocks. Many rocks send out β -rays in considerable intensity, and of penetrating power varying with the nature of the rock. Potassium accounts for this in some cases, but in others the rays are much more penetrating, and may be due to mesothorium-² or to unrecognised radioactive substances.

F. S.

Radiation from Quinine Sulphate, Ionisation, and Luminescence. MAURICE DE BROGLIE and L. BRIZARD (*Compt. rend.*, 1911, 152, 136—138).—The ionisation produced in a gas when quinine or cinchonine sulphate is heated, or allowed to cool after heating, appears to be connected with the production of small electrical discharges due to disruption of the crystals. Thus, on heating cinchonine sulphate at 120° for half an hour and allowing it to cool in the air,

brilliant scintillations are visible under a lens recalling those seen in a pinbariscope. The scintillations increase under diminished pressure. The luminous and electrical phenomena are more marked in hydrogen than in air.

W. O. W.

The Isolation of an Ion and the Exact Measurement of its Charge; Correction to the Law of Stokes. R. A. MILLIKAN (*L*e Radium, 1910, 7, 345—360).—A cloud of droplets of oil, mercury, or other non-volatile liquid is produced by spraying in dust-free air above a condenser with horizontal plates. A few droplets are allowed to fall through a small hole in the upper plate, which is then closed, and one droplet, illuminated by a horizontal beam from an arc lamp passed through a long column of water, is kept under observation in a cathetometer. By alternately applying a suitable electric field to the plates of the condenser and discharging them, the same drop may be watched for many hours at a time, falling under gravity and ascending against it under the field in the same vertical line. In absence of the field during the fall of the drop, the air is always ionised to a certain extent naturally, and this ionisation may be increased at will by the presence of radioactive preparations. The speed of fall is throughout independent of the charge on the drop if precautions are taken against air currents, but as, during the fall, one or more ions of either sign may join themselves to the drop, altering by definite increments the value of its charge, the speed of ascent, which is a simple function of the charge on the drop, varies step-wise in successive measurements. In one case the speed of fall and ascent were observed for a single negatively-charged drop for four and a quarter hours, during which the number of atomic charges on the drop varied from 4 to 17. The value of the charge can be altered at will by holding the drop with a suitable field near to either plate with the air uniformly ionised by radium. Near the plate the concentration of the ion of opposite sign to the plate is the greater, so that to increase the charge on a positively charged drop, it is kept near the negative plate, when more positive than negative ions attach themselves to it. The spontaneous alteration of the charge during descent must be due to the kinetic energy of the ion, assisted or opposed by the electrostatic attraction or repulsion, according to the sign, projecting the ion against the drop. Since the spontaneous accretion of negative ions by a drop already charged negatively with 126 to 150, but never more, units has been observed, it follows that the kinetic energy of the ion must be greater than $4 \cdot 6$ to $5 \cdot 47$ ($\times 10^{-14}$ ergs). This agrees with the accepted value ($5 \cdot 756 \times 10^{-14}$ ergs) for the kinetic energy of a molecule at ordinary temperatures, as deduced from the kinetic theory, and furnishes a direct experimental proof of the existence of this kinetic energy. The results of forty-seven days consecutive observations, comprising 33 drops, ranging in radius from 313 to $6581 (\times 10^{-7} \text{ cm.})$, as determined from the velocity of fall under gravity, gives a mean value for, e , the atomic charge, $1 \cdot 9016 \times 10^{-10} \text{ E.S.U.}$, with a probable error of 1 in 1000, although the value involves that of the coefficient of viscosity of the air, taken as $0 \cdot 0001785$ at 15° , which may be wrong to 5 in 1000. By assuming

always a multiple of this charge and measuring the departures from it for drops comparable in diameter with the mean free path of the molecule, it is deduced that Stokes' Law gives velocities of fall for such drops which must be multiplied by $1 + Al/a$, where l is the mean free path of the molecule, a the radius of the drop, and A a constant found equal to 0.815. This is in agreement with the theory of Cunningham based on kinetic considerations.

F. S.

The Ions and Neutral Particles Present in Certain Gases when Recently Prepared. LéON BLOCH (*Le Radium*, 1910, 7, 354—362).—It is probable that ions produced by spraying, bubbling, and splashing are produced in the same way as those produced in chemical reactions. A liquid surface disengaging very fine bubbles of hydrogen by chemical action was made one plate of a condenser, and it was found that the current was nearly proportional to the voltage, no indication of saturation being obtained with fields exceeding 1100 volts. This is shown to be due to the projection from the surface of neutral particles which, when a field is applied, become charged electrostatically, carrying away part of the surface charge. The larger part of the ionisation due to chemical reactions is due to these "neutral particles," which become charged electrostatically and which are to be sharply distinguished from true ions, because their charges and mobilities are functions of the electric field where they originate. They are to be distinguished from dust particles, etc., which attract "small ions" forming "large ions," for they do not form "large ions" in this way. They are formed in liquids which give ions by bubbling, whilst the "neutral centres," similar to those investigated by others, which are produced by bubbling are only formed in liquids which do not give ions. They are too small to be visible in the ultramicroscope, and may be present in large numbers in a gas optically void. Determination of their diffusion coefficients and mobility gave 2.5 units for the mean value of their charge, but the particles are too small to obey Stokes' Law, and probably have a radius of the order of 10^{-7} cm. Their production is prevented by a layer of benzene, petroleum, and various oils, also by alcohols and ethyl ether, but acetone and aldehyde do not stop their formation. In the first case the action cannot be explained by supposing that the surface liquid stops the formation of spray. Since a liquid does not lose its charge by evaporation, there must exist somewhere between the dimensions of these new "neutral particles" and that of the molecule a critical diameter at which the particle loses its power of becoming electrified by contact.

F. S.

A Relationship between the Temperature-coefficient and the Specific Resistance of Certain Metals, with Special Reference to Copper. STEPHAN LINDESK (*Ber. Deut. physikal. Ges.*, 1911, 13, 65—71).—From a comparison of the data for a large number of samples of copper, it is found that the product of the specific resistance (c) and the temperature-coefficient (α) at a given temperature is very nearly constant. At 15° the mean value of the product is 6.78×10^{-5} , and the relationship holds good for samples of copper the specific resistances of which vary as much as 3:1. For

copper containing a considerable proportion of arsenic, the conductivity of which is only one-eleventh of that of pure copper, the product ca has nearly the same value as that for the pure metal.

Similar relationships have been found in the case of samples of commercial aluminium and iron. For aluminium the value of $c_{13}a_{13}$ is 11.6×10^{-5} , and for iron, 58.5×10^{-5} . The relationship appears therefore to be of a general nature.

H. M. D.

Experiments with Metallic Conductors of Very High Resistance and the Application of the Electron Theory. HILDA VON MARTIN (*Physikal. Zeitsch.*, 1911, 12, 41–48).—The conduction of electricity through columbite and stibnite, both of which have a specific resistance of the order of 10^7 ohms, takes place according to Ohm's law. From observations on the variation of the resistance with the temperature, the heat of dissociation is calculated to be about 4400 for columbite and about 10,000 for stibnite. According to this, the latter occupies a position between those substances for which the conduction is electronic in character, and those for which the conduction is due to ions.

Various anomalous phenomena have been observed in the further investigation of the conducting properties of stibnite. On prolonged passage of a current through the substance in one direction, the conductivity increases, but this increase is accompanied by a diminution of the conductivity when the current is passed in the opposite direction. The original direction of the flow of the current is without influence on this phenomena. After the lapse of a considerable time, during which no current is passed through the stibnite, it returns to its original condition. This unipolar effect, which is quantitatively reproducible, cannot be attributed to polarisation.

A further primary unipolar effect is also observable which cannot be reproduced in a quantitative manner, and this is supposed to be due to lack of homogeneity in the crystal under examination.

H. M. D.

Regularities in the Changes of the Electrical Conductivity of Metals on Liquefaction. ERNST WAGNER (*Ann. Physik*, 1910, iv], 33, 1484–1492).—A comparison of the electric conductivities of solid and liquid metals at the melting point shows that in many cases the conductivities are related to one another in a simple manner. For mercury the ratio of the conductivity of the solid to that of the liquid is approximately 4; for lead, zinc, tin, cadmium, thallium, and tellurium 2; for sodium, potassium, rubidium, and caesium 1.5, and for bismuth and gallium 0.5.

If the number of free electrons in unit volume is the same for the two states of aggregation, the changes in the conductivity must be attributed to simply related changes in the mobilities of the electrons. The possibility that these changes are connected with variations in the molecular complexity in the solid and liquid states is discussed.

H. M. D.

The Thomson Effect and its Variation with Temperature in Lead, Mercury, Tin, Zinc, Cadmium, and Aluminium. PAUL CERMAK (*Ann. Physik*, 1910, [iv], 33, 1195–1215).—Measurements

of the Thomson effect in the above six metals have been made at various temperatures reaching up to 350° . In general, the magnitude of the effect increases as the temperature rises, but this increase is not consistent with the assumption that the Thomson effect is proportional to the absolute temperature. At the melting point, the curves which show the relationship between the Thomson effect and the temperature are apparently quite continuous, in spite of the very considerable change in the conductivity.

H. M. D.

The Dielectric Constants of the Halogen Compounds of Lead. AUGUST LENERT (*Ber. Deut. physikal. Ges.*, 1910, 12, 1051—1053).—The fact that the pure halogen compounds of lead have a very small electric conductivity has led the author to measure their dielectric constants. The substances were examined in the form of powder or compressed plates by Nernst's method, and gave the following values: lead chloride, 4·20; bromide, 4·89; iodide, 2·35, and fluoride, 3·62. A determination of the dielectric constant of the chloride by Drude's method confirmed these results. After the substances had been melted and solidified, much higher values were obtained, and this is attributed to the loss of halogen and the formation of sub-halides.

H. M. D.

The Cathode Fall in Argon (Air, Nitrogen, Hydrogen), and the Periodic System of the Elements. KARL ROTTGARDT (*Ann. Physik*, 1910, [iv], 33, 1161—1194).—Observations have been made relating to the distribution of potential in discharge tubes containing different gases and cathodes of different metals.

A considerable difference of potential exists between the two ends of the negative glow region. This varies from 26 to 60 volts in argon, from 26 to 56 volts in air, from 26 to 49 volts in nitrogen, and from 30 to 60 volts in hydrogen. By using different metals as cathodes, it is found that the potential fall in the glow light increases as the cathode fall increases. Although the fall of potential in the glow light is practically constant when the cathode fall is normal, it appears to increase slightly with increasing current density and with diminution in the pressure.

The normal cathode fall is defined as the minimum value of the potential difference between the earthed cathode and that part of the negative glow region which is in immediate contact with the cathode dark space. For variations in pressure, current strength, and dimensions of the discharge tube, the normal cathode fall, defined in this way, appears to be constant within 5% when the tube contains argon, and within 3% for the other gases investigated.

In argon the normal cathode fall has the same value for series of metals which have the same valency, and diminishes as the valency increases. For copper, silver, and gold it is 131 volts; for magnesium, zinc, and cadmium 119 volts, and for aluminium 100 volts. Tin and lead gave 123·5, and approximate therefore to the bivalent metals, while antimony and bismuth gave 135·5. Similar relationships are found between the cathode falls in nitrogen. In hydrogen the normal cathode potential increases in most cases with the passage of the

discharge, and this is attributed to the conversion of the metal into a hydride.

When small quantities of foreign gases are admixed with argon, the normal cathode fall is altered to a considerable extent, hydrogen having the smallest, oxygen and water the greatest, effect. With a zinc cathode, the change brought about by 2% of moist oxygen is equal to that effected by 10% of nitrogen or 35% of hydrogen.

H. M. D.

Value of the Components of the Electromotive Force of the Voltaic Couple. GIOVANNI GUGLIELMO (*Atti R. Accad. Lincei*, 1910, [v], 19, ii, 572—577).—If V be the electromotive force of the couple, V' and V'' the difference of potential between the metals and the electrolyte respectively, C' and C'' the respective heats of combustion (in Joules) of 1 gram-equivalent of the metals with the electronegative constituents of the solution, and e the quantity of electricity which produces this amount of chemical action (for 1 gram-equivalent, e will be 96540 coulombs), then $V = V' - V'' = (C' - C'')/e$, whence $V' = C'/e + K$, and $V'' = C''/e + K$. If K be negligibly small, $V' = C'/e$ and $V'' = C''/e$. The value of K can be calculated, however: (1) by using Helmholtz's formula $V' = C'/e + dV'/dTdT$, from which it follows that $K = dV'/dTdT = dV'/dTdT$; the value of K calculated by this means from the experimental results of previous workers is 0.22 volt; (2) by applying the fact that of the total heat of combination, C' , of one of the metals only a fraction, c' , appears locally, the rest manifesting itself in the whole circuit: hence $V' = (C' - c')/e$, and $V'' = (C'' - c'')/e$, and therefore $K = c'/e = c''/e$; the value of K obtained by this method is also about 0.2 volt.

R. V. S.

Mercurous Sulphate as Depolariser in Weston and Clark Normal Cells. P. J. H. VAN GINNEKEN (*Zeitsch. physikal. Chem.*, 1911, 75, 687—709).—A theoretical paper. Hulett (Abstr., 1904, ii, 695) observed that the *E.M.F.* of a cadmium element rose on shaking to a value higher than the normal, but slowly recovered the former value when kept. He gave an explanation of this based on the slow hydrolysis of mercurous sulphate and the consequent increase of the "mercury concentration" in the solution. It was further assumed that the hydrolysis is accelerated by the catalytic action of the mercury surface. It is not clear exactly what Hulett means by "mercury concentration" in this case. The author accepts Hulett's assumptions in the main, but shows as the result of a detailed consideration of the equilibria in the system that the mercury ion concentration would be diminished and not increased by hydrolysis. The author's explanation of the observations is as follows. On remaining quiescent, hydrolysis takes place fairly rapidly in the layer in contact with the mercury surface, owing to the catalytic action of the latter, but is very slow in the main bulk of material. The result is that the mercury ion concentration in the surface layer diminishes and the *E.M.F.* falls, but, on shaking, the mercury concentration in the surface layer becomes practically the same as that in the main bulk of material, and the *E.M.F.* rises. In normal circumstances, therefore, the *E.M.F.* is depressed owing to hydrolysis.

G. S.

Thermodynamics of Normal Cells. ERNST COHEN (*Chem. Weekblad*, 1911, 8, 1-4. Compare Abstr., 1910, ii, 176).—The values obtained by the thermochemical method for the chemical energy of the normal cells of Clark and of Weston differ from those derived from Gibbs and von Helmholtz's equation by the aid of electro-measurements. The author attributes the discrepancies to errors in the temperature formulae employed. For neither cell can the relation of *E.M.F.* to temperature be represented by a continuous curve.

A. J. W.

Determination of Specific Heats at Low Temperatures and Their Use in the Calculation of Electromotive Forces. F. POLLITZER (*Zeitsch. Elektrochem.*, 1911, 17, 5-14).—The method of measuring the rise of temperature produced by the addition, electrically, of a known quantity of heat, described by Nernst (Abstr., 1910, ii, 263), is employed. The specific heats of zinc, mercury, heptahydrated zinc sulphate, and of mercurous sulphates and chloride are determined at temperatures between -200° and -30° . The results are calculated by means of the formula given by Magnus and Lindemann (Abstr., 1910, ii, 580), the values of the constants being :

	α .	$\beta\nu$.	α .
Zn	1	173	$5 \cdot 4 \times 10^{-5}$.
Hg (solid).....	1	89	$21 \cdot 0 \times 10^{-5}$.
Cl	1	236	—

The specific heat of mercurous chloride is calculated by adding the expressions for one atom of mercury and one of chlorine, the value of α for the compound being 12×10^{-5} . With the more complicated substances, zinc sulphate and mercurous sulphate, empirical expressions were used instead of attempting to introduce a special value for the frequency of each kind of atom.

The heat of fusion of mercury is found to be 554.5 cals. per gram-atom at the melting point, -38.7° .

Using these data, the following *E.M.F.*'s are calculated by means of Nernst's theorem :

$Zn | ZnSO_4 \cdot 7H_2O | Hg_2SO_4 | Hg (-7^{\circ})$, 1.4610 volt (calculated), 1.4556 volt (obs.).
 $Hg | HgCl | PbCl_2 | Pb (-39^{\circ})$, 0.4636 volt (calculated), 0.5216 volt (obs.).
 $Hg | HgCl | AgCl | Ag (-39^{\circ})$, 0.0341 volt (calculated), -0.0270 volt (obs.).

The differences between the observed and calculated values in the last two cases are possibly due to errors in the values of the heats of formation of the compounds.

T. E.

Calculation of Electromotive Force from Thermal Effects. ERNST COHEN (*Chem. Weekblad*, 1911, 8, 51-52; *Zeitsch. Elektrochem.*, 1911, 17, 143-145. Compare Pollitzer, preceding abstract).—The great discrepancies between the values deduced by the aid of Nernst's theorem for the *E.M.F.* of galvanic combinations and those obtained by experiment are attributed by Pollitzer to errors in the thermochemical determinations involved. The author points out that for a cell $Hg-HgCl-PbCl_2-Pb$, the difference is due to the use of an electrode of lead amalgam instead of pure lead. A. J. W.

Mathematical Theory of the Changes of Concentration at the Electrode brought about by Diffusion and by Chemical Reaction. T. R. ROSENBRUGH and W. LASH MILLER (*J. Physical. Chem.*, 1910, 14, 816—883).—A mathematical paper, in which the changes in concentration at the electrodes which take place as the result of electrolysis under different conditions have been deduced from a consideration of the effects of ionic migration and diffusion.

H. M. D.

The Behaviour of Copper Anodes in Chloride Solutions. SAUL DUSHMAN (*J. Physical Chem.*, 1910, 14, 885—908).—The behaviour of copper anodes in the electrolysis of solutions of hydrochloric acid in the absence of air has been investigated. In an extensive series of experiments, in which the concentration of the hydrochloric acid was varied from 0·00465 to 0·01615 mol. per litre, the current from 0·013 to 0·051 ampere, the anode area from 18 to 47 square cm., and the rate of circulation of the electrolyte from 0·242 to 361 c.c. per second, it was found that the proportion of the copper which passed into solution as cuproion varied from 25 to 74%. By taking into account the change resulting from diffusion, values have been obtained for the constant $K = [\text{Cu}^{+ \cdot \cdot}] / [\text{Cu}^{\cdot}]^2$ corresponding with the equilibrium $\text{Cu}^{+ \cdot \cdot} + \text{Cu} \rightleftharpoons 2\text{Cu}^{\cdot}$. The numbers so obtained vary from $0\cdot5$ to $3\cdot5 \times 10^{-4}$, whereas the value obtained by Bodlander and Torbeck from experiments in which finely divided copper and cuprous chloride were shaken with solutions of potassium chloride was 5×10^{-4} .

The proportion of copper dissolved as cuprous salt at a rotatory node in hydrochloric acid with different concentrations of acid, current densities, rates of rotation of the anode, and rates of circulation of the electrolyte, is found to be in accord with the assumption of the above equilibrium condition.

H. M. D.

Velocity of Anodic Solution of Nickel in Normal Sulphuric Acid. C. Russo (*Gazzetta*, 1910, 40, ii, 491—508).—The rate at which nickel functioning as anode passes into solution in normal sulphuric acid is proportional to the strength of the current when this is not great. After a certain critical strength of current has been reached (usually about 0·1 ampere), the electrode is passive, and the rate of solution decreases, being a linear function of the current strength. A minimum is plainly observable when the current is 1·4 ampere, and thereafter the velocity of solution increases again, forming a linear function of the strength of the current. R. V. S.

Comparison between the Velocity of Solution and the Anodic Polarisation of Nickel in Normal Sulphuric Acid. C. Russo (*Gazzetta*, 1910, 40, ii, 508—518. Compare preceding abstract).—The results obtained by the author support the theory of Fothmann and Frauenberger that the passivity of nickel is due to the formation of a solid solution of oxygen at the surface of the anode. Following the variation of anodic polarisation with increasing current, no sudden change is observed which could correspond with

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the singular point (at 0·4 ampere) in the curve of velocity of anodic solution, so that the existence of the latter must be due to some cause which does not sensibly affect the polarisation. It is suggested that it may be connected with the discharge of the ion HSO_4^- . When a certain degree of polarisation has been exceeded, the nickel anode no longer remains practically unattacked by the solution; in spite of the gaseous envelope of oxygen which surrounds it, it is in a semi-active condition, and this forms another argument in favour of the hypothesis that the passivity of the metal is due to dissolved not to enveloping, oxygen.

R. V. S.

Planck's Formula for Diffusion Potentials. NIELS BÆRREY (*Zeitsch. Elektrochem.*, 1911, 17, 58–61).—Planck's formula for the difference of potential between two solutions of electrolytes is obtained on the assumption that two solutions of constant concentration are separated by a layer the composition of which is also not changed by the diffusion going on through it. This condition is not fulfilled in general. The real state of affairs is better represented by a formula obtained by Henderson from Nernst's theory (Abstr., 1907, ii, 125; 1908, ii, 655), in deducing which it is supposed that the two solutions are separated by a fairly thick layer in which they have simply mixed together. It is shown that when such a layer is formed, the potential difference changes with the time, the change being inversely proportional to the thickness of layer. For 0·1*N*-potassium chloride and 0·01*N*-hydrochloric acid and a layer of separation 1 cm. thick, the change is about 0·2 millivolt in a quarter of an hour; usually it is much smaller and quite negligible.

T. E.

Electrometric Measurements [of Acidity] in Liquids containing Carbon Dioxide. K. A. HASSELBALCH (*Biochem. Zeitsch.*, 1910, 30, 317–331).—The measurements were made with the hydrogen electrode by a slight modification of the usual method. Hydrogen was passed for half an hour through the electrode vessel containing the electrode only until the latter was thoroughly saturated. The solution to be examined, saturated with air or oxygen, was then drawn in until its upper surface just touched the bottom of the electrode, the electrode vessel was then shaken to establish equilibrium between the liquid and the gas space, and the potential measurements made in the usual way. This method gives satisfactory results for solutions saturated with air or oxygen (the latter gas produces no depolarising effects on the electrode), but is not satisfactory for solutions containing carbon dioxide, as the latter escapes into the gas space, and the measured H^+ ion concentration is too low. This difficulty has been overcome by shaking one portion of the solution until equilibrium is established with the gas space; this portion is then replaced by a second portion, and as the gas space already contains carbon dioxide none of the gas escapes from the liquid. A series of measurements with blood shows that the previous methods of measurements (compare Michalis and Rona, Abstr., 1909, ii, 680) give rather too low values for the H^+ ion concentration, as would be anticipated from the sort of error above referred to.

G. S.

Rationality of the Ratios of the Magnetic Moments of Atoms and a New Universal Constituent of Matter. PIERRE WEISS (*Compt. rend.*, 1911, 152, 187—189. Compare this vol., ii, 91).—Values have been calculated for the magnetic susceptibility at absolute specific saturation of a number of metals in the form of aqueous solutions of their salts. To explain the results, which together with those of Pascal and others are shown in graphic form, the author is led to assume the existence in all forms of matter of *magneton*, a substance having a definite determinable magnetic moment.

W. O. W.

New Method for Investigation of the Magnetic Permeability of Gases. W. P. ROOP (*Physikal. Zeitsch.*, 1911, 12, 48—56).—A method of determining the difference between the magnetic permeabilities of two gases is described, which depends on the deflexion of a jet of the one gas streaming through the other under the influence of a magnetic field in which the lines of force are very unevenly distributed. From experiments with carbon dioxide and air, for the former of which the magnetic susceptibility is probably nil, the susceptibility of air has been found to 0.9260×10^{-6} . H. M. D.

The Magnetism of the Copper-Manganese-Tin Alloys under Varying Thermal Treatment. ALEXANDER D. ROSS and ROBERT C. GRAY (*Proc. Roy. Soc. Edin.*, 1910, 31, 85—99. Compare Abstr., 1909, ii, 859).—A series of ternary alloys has been prepared in which copper and manganese are present throughout in the ratio 7 : 3, whilst the alloys contain respectively 14, 16, 18, 30, 38, and 48% of tin. The alloys, cast in the form of rods, were tested magnetically as cast, and also after normalising by heating and cooling fairly rapidly. Other specimens were tested after baking for several hours at 180° or 200°, and after annealing at higher temperatures. Baking diminishes the susceptibility, and increases the coercive force and hysteresis. The three alloys containing the smallest quantity of tin are much more magnetic at —190° than at the ordinary temperature. Quenching from 350° or 580° produces complex changes, the coercive force being always diminished, and the effect cannot be reversed by again annealing. The quenched alloys are more improved in magnetic properties by cooling to —190° than those in the normal condition.

C. H. D.

The Magnetisation of Ferro-magnetic Substances above the Curie Point. PIERRE WEISS and G. FOIX (*Arch. Sci. Phys. Nat.*, 1911, [iv], 31, 5—19).—In connexion with an investigation of the variation of magnetisability with the temperature, preliminary measurements of the coefficient of magnetisation of anhydrous cobalt sulphate and the heptahydrated salt and of solutions of cobalt and nickel nitrate have been made with a specially designed form of apparatus.

H. M. D.

Use of the Magnetic Field as a means of Determining Constitution in Organic Chemistry. VI. PAUL PASCAL (*Bull. Soc. chim.*, 1911, [iv], 9, 79—84. Compare Abstr., 1910, ii, 100, 179, 180; this vol., ii, 91).—The method of calculating magnetic suscepti-

bilities of carbon compounds has been described previously, and it has been shown that although this property is additive, a correction B must be made, the value of which varies with the structure of the group of compounds under consideration.

The present communication deals with cycloid substances, and it is shown that ring-formation invariably exalts the magnetic susceptibility. For purposes of calculation in these cases, a definite value is assigned to each carbon atom, apart from its intrinsic value as a carbon atom, according as it occurs in one ring only (mononuclear carbon, as in benzene), two rings (binuclear carbon, as in naphthalene), or three rings (trinuclear carbon, as in chrysene). The values of B for carbon atoms so linked are -2.5×10^{-7} , -32.0×10^{-7} , and -42.0×10^{-7} respectively. The magnetic susceptibility of indene, C_9H_8 , calculated according to these rules and those already given (*loc. cit.*) is $(-9 \times 62.5 + -8 \times 30.8 + -2 \times 32.0 + -6 \times 2.5)10^{-7} = -885.5 \times 10^{-7}$, which compares well with the experimental value -883×10^{-7} . The magnetic susceptibilities found experimentally are best explained by the Claus formulae for cycloid substances, but they are not entirely in harmony with any formulae yet put forward. A long list of calculated and experimental values for compounds of various types is given, showing, as a rule, good agreement between the two values.

T. A. H.

Electrical Double Refraction (Kerr Effect) in Liquids and its Relation to Chemical Composition and Constitution. ALEXANDER LIPPMANN (*Zeitsch. Elektrochem.*, 1911, 17, 15-20).—The values of the electro-optical constants of some eighty-eight substances dissolved in benzene are determined. It appears that this constant is influenced enormously by the constitution of the substances, depending, for example, in the case of benzene derivatives on the number, nature, and relative positions of the substituting groups.

T. E.

Experiments Relating to the "Swarm" Theory of Anisotropic Liquids. EMIL BOSE (*Physikal. Zeitsch.*, 1911, 12, 60-62. Compare Abstr., 1909, ii, 383).—Observations relating to the behaviour of anisotropic liquids in a magnetic field are described as evidence in support of the theory which the author has put forward previously. In a magnetic field, the lines of force in which are parallel to the line of sight, a clearing of the turbid liquid has been observed in the case of anisaldazine, *p*-azoxyanisole, *p*-azoxyanisolephenetole, and a mixture of anisylidenepropionic acid with anisic acid. With cholesterol benzoate, which is much more viscous than the other substances examined, no effect was obtained even when a strong magnetic field was employed. With a weak field, the clearing takes an appreciable time, but the clearing period diminishes rapidly with increase in the strength of the field.

When the lines of force of the applied field were at right angles to the line of sight, no clearing effect was observed in any of the substances examined.

H. M. D.

Density, Coefficient of Expansion, and Variation in Volume on Fusion of the Alkali Metals. LOUIS HACKSPILL (*Compt. rend.*, 1911, 152, 259—262).—A description is given of the methods whereby the following results have been obtained:

Column *A* contains the coefficients of expansion of the solid metals, *B* the same constants for the liquid metals at temperature *t*, and *C* the percentage increase in volume on fusion.

	D°.	D ^{15°} .	A.	B.	t.	C.
Cs	1·9029	—	0·000291	0·000341	23—50°	2·32
				0·000348	50—123°	
Rb	1·5248	—	0·00027	0·000339	49—140°	2·28
K	0·859	—	{ 0·00025 (at 0—58°)	0·000280	70—100°	2·12
				0·000285	100—150°	
Na	0·9725	0·9385 { 0·000216 (at 0—80°)}		0·000275	160—180°	1·50

Toluene and benzene are rapidly attacked by liquid caesium. The compounds formed are under investigation. W. O. W.

Anomalous Expansion of Nickel Steels. CHARLES ÉDOUARD GUILLAUME (*Compt. rend.*, 1911, 152, 189—191).—The coefficients of expansion of reversible alloys of iron and nickel have been determined, and the results plotted in the form of a curve, showing the variation of the coefficient as a function of the proportion of nickel. Owing to the small cohesion of the pure alloys, specimens containing a small proportion of manganese (or chromium), silicon, and carbon were employed. The curve shows a well-marked minimum, corresponding with about 36% of nickel; as the percentage of the latter rises, it gradually approaches, and finally coincides with, the line representing the expansion as calculated from the law of mixtures.

The effect of the manganese and chromium in the alloys has also been studied. The influence of these metals on the expansion is somewhat complex; in general, the addition of small amounts of manganese diminishes the expansion in the neighbourhood of the minimum of the curve. W. O. W.

The Variation of the Thermal Conductivity of Solid Non-Metals with the Temperature. ARNOLD ECKREN (*Ann. Physik*, 1911, [iv], 34, 185—221).—Two forms of apparatus are described which have been used in the investigation of the thermal conductivity of crystalline and amorphous substances. From experiments with crystals of sodium chloride, potassium chloride, fluorspar, calc spar, sodium chlorate, and sucrose between —190° and +100°, it is found that the thermal resistance increases in approximately the same ratio as the absolute temperature. This holds with greater exactness for quartz in a direction perpendicular to the axis than for any of the other substances examined. The magnitude of the thermal conductivity does not depend on the system to which a particular crystal belongs. In general it is found to increase with a diminution in the number of atoms in the molecule of the substance and with increase in the melting point. Crystals containing two and three atoms in the

molecule have approximately the same thermal conductivity at their respective melting points.

For substances in the form of crystalline aggregates, the above relationship between thermal conductivity and temperature does not hold. This is attributed to the existence of thermal resistance between the individual small crystals, and this effect becomes relatively more important as the conductivity of the substance increases.

According to experiments with various kinds of glass, the behaviour of amorphous substances is quite different from that of crystals, for the thermal resistance of these diminishes as the temperature rises. A comparison of the conductivity of the same substance in the crystalline and amorphous form shows that the crystalline form always conducts better than the amorphous. At 0° crystalline quartz conducts 75 times, and at -190° fifty-five times, as well as fused quartz. At the melting point the conductivities are probably equal. H. M. D.

Connexion between the Elastic Properties and the Specific Heat of Solid Substances Consisting of Monatomic Molecules. ALBERT EINSTEIN (*Ann. Physik.*, 1911, [iv], 34, 170-176).—Reference is made to the calculation by Sutherland (Abstr., 1910, ii, 946) of the wave-lengths which correspond with the fundamental mechanical vibrations of the atoms of the alkali metals and the halogens, and it is pointed out that the frequencies corresponding with the molecular vibrations of monatomic substances can be calculated from the variation of the specific heat of these substances with the temperature. The wave lengths, which have been deduced from the elastic properties for ten different metals, vary from $\lambda = 45 \times 10^{-4}$ for aluminium and nickel to $\lambda = 163 \times 10^{-4}$ for bismuth. The value for silver is $\lambda = 73 \times 10^{-4}$, whereas that calculated from the variation of the specific heat with the temperature is $\lambda = 90 \times 10^{-4}$. For the other metals, the specific heat at low temperatures is not known accurately enough to permit of a comparison, but the agreement in the case of silver affords strong evidence of the correctness of Sutherland's views relating to the nature of the ultra-red rays. H. M. D.

Specific Heat of Carbon Tetrachloride and of its Saturated Vapour. JAMES E. MILLS and DUNCAN MACRAE (*J. Physical Chem.*, 1911, 15, 54-66. Compare Abstr., 1910, ii, 932).—The method previously described for benzene has been used to determine the specific heat of carbon tetrachloride with a maximum error of ± 0.001 . The purified tetrachloride of b. p. 76.64° to 76.69° at 760 mm. has a specific heat which increases regularly from 0.2010 at 0° to 0.2031 at 70° . This value is somewhat lower than that obtained by Hirn and by Winkelmann at the same temperatures.

The specific heat of the saturated vapour is calculated from the heat of the liquid and the latent heat. The values obtained are somewhat lower if the latent heat is calculated by the thermodynamical equation than if by the equation given by Mills (Abstr., 1909, ii, 861).

The specific heat of the vapour falls from 0.140 at 0° to 0.115 at 70° .

according to the latter method of calculation, which is preferred by the authors.

When the quantities of heat employed in doing external work, in increasing the kinetic energy of the molecules, and in overcoming molecular attraction are subtracted from the specific heat, there remains about 0·3 cal. in the case of benzene liquid or vapour, and of 0·16 cal. in the case of carbon tetrachloride, unaccounted for.

Nearly as much energy is required to raise carbon and hydrogen, combined as benzene, from -273° to $+20^{\circ}$ as when they exist separately.

R. J. C.

The Specific Heat of Liquid Benzene and of its Saturated Vapour. JAMES E. MILLS and DUNCAN MACRAE (*J. Physical Chem.*, 1910, 14, 797—815).—Measurements have been made of the specific heat of liquid benzene at temperatures ranging from the freezing point to 70° , a Dewar vessel being employed as calorimeter and the heat supplied by an electrical current. The specific heat varies with the temperature in a linear manner, the straight line representing the data giving the values 0·3970 and 0·4369 at 0° and 70° respectively.

From the heats of vaporisation of benzene at different temperatures, the authors have also calculated the specific heat of the saturated vapour. It is shown that the heats of vaporisation obtained in different ways are not in satisfactory agreement, and as a consequence the calculated specific heat values differ considerably according to the vaporisation data which are utilised. The values, adopted tentatively, lie on a straight line corresponding with the specific heats 0·284 and 0·268 at 0° and 70° respectively.

H. M. D.

The Latent Heat of Fusion of Antimony Trichloride and Tribromide, Arsenic Trichloride, and Stannic Bromide in Relation to the Molecular Depression of their Freezing Points. STANISLAW TOŁLOCZKO and M. MEYER (*Chem. Zentr.*, 1910, ii, 1021—1025; from *Kosmos*, 1910, 25; *Radziszewski-Festband*, 641—648).—The latent heats of fusion of antimony trichloride and tribromide, arsenic trichloride, and stannic bromide were determined from the measurement of the heats of solution of the substances in solid and liquid (supercooled) states, in 20·5% hydrochloric acid solution, and 25% hydrobromic acid solution, and the results are given. The molecular depression of the freezing points calculated from these latent heats of fusion agree with those obtained by cryoscopic methods. At the same time it is shown that the latent heat of fusion given by Berchelot (*Thermochimie*, 1897, 2, 156) for stannic bromide, 7·07 cal., was much too high. The specific heat of a 25% dilute hydrobromic acid solution is 0·715 cal.

N. C.

Use of a Dewar Flask in Measurements of Heats of Neutralisation. J. HOWARD MATTHEWS and A. F. O. GERMAN (*J. Physical Chem.*, 1911, 15, 73—82).—By the use of a silvered Dewar flask as calorimeter in measurements of heats of neutralisation, the radiation correction is much reduced and the error due to thermometric lag is minimised. The acid is placed in the Dewar flask and is stirred

by an inner reciprocating tube containing the equivalent of alkali, which in turn contains a rotating stirrer. The liquids are brought into contact by tearing with the rotating stirrer the rubber disc which forms the bottom of the inner vessel. Only one thermometer is required.

Parallel determinations of the heats of neutralisation of sodium hydroxide by hydrochloric, nitric, sulphuric, and acetic acids in $2N$, N , $N/2$, and $N/4$ strengths were in very close agreement in every case, and show that the method is susceptible of great accuracy. Stress is not laid on the actual values obtained in this investigation, since the thermometer was not specially standardised.

R. J. C.

Thermochemical Analysis of Tautomeric Compounds. WOJCIECH SVENTOSLAVSKY (*Chem. Zeitr.*, 1910, ii, 1022; from *Łosie, 1910, 35, Radziszewski-Festband*, 469—477).—The analysis of the thermochemical data of organic compounds led the author to study the thermochemical characteristics of some atomic linkings. These characteristics make it possible to state the energy contents of tautomeric forms of the same compound. The author explains the results for some examples of well known tautomeric compounds, and shows that the mutual interconversion of tautomeric forms of ethylacetacetate, isatin, and benzoquinoneoxime takes place either without any heat change, or is accompanied by very slight thermal disturbance. In the two tautomeric forms of methylisatin, the energy content is decidedly different: the mutual interconversion of the two forms would be accompanied by considerable heat effect, and therefore it does not take place.

N. C.

The Influence of Temperature on the Compressibility of Metals. EDWARD GRUNISEK (*Ann. Physik*, 1910, [iv], 33, 1239—1274).—An apparatus is described by means of which measurements of the compressibility of metals at different temperatures have been made. Iron, copper, silver, and platinum were investigated between -190° and $+165^{\circ}$, aluminium between -190° and $+125^{\circ}$, and tin and lead between -190° and $+16^{\circ}$. These data show that in some cases the compressibility increases with the temperature according to a linear equation, whilst in others the increase is more rapid. At low temperatures the magnitude of the thermal coefficient of the compressibility increases as the coefficient of thermal expansion increases.

H. M. D.

Thermal Molecular Pressure of Gases in Tubes. MARTIN KNUDSEN (*Ann. Physik*, 1910, [iv], 33, 1435—1448).—A method of measuring small differences of pressure is described. This has been employed to determine the molecular pressures of hydrogen and oxygen contained in a tube, different parts of which are at different temperatures. If p_1 and p_2 denote the molecular pressures observed at points the absolute temperatures of which are T_1 and T_2 , these are found to be connected by the equation: $p_1^2 - p_2^2 = C(T_1^{\frac{2}{3}} - T_2^{\frac{2}{3}})/273 \frac{\text{dynes}}{\text{cm}^2 \text{m}^3}$, where C is a constant which depends on the diameter of the tube, on the viscosity of the gas, and on its density.

H. M. D.

Application of the Principle of Archimedes to the Exact Determination of the Densities of Gases. ADRIEN JAQUEROD and M. TOURPAIAN (*Arch. Sci. Phys. Nat.*, 1911, [iv], 31, 20–35).—A method of measuring gas densities is described which depends on changes in the weight of a closed cylindrical glass tube when suspended in the different gases. This cylinder is suspended by a thin platinum wire from one arm of a balance, and is surrounded by a wider tube immersed in a thermostat. The wider tube is provided at its lower end with an inlet through which the gas to be examined is introduced. At its upper end the containing tube is drawn out to a capillary sufficiently wide to permit of the free movement of the platinum wire suspension. For experiments with chemically active gases, an attachment is provided above the hydrometer tube by means of which the gases can be removed from the neighbourhood of the balance. With this apparatus the density of oxygen at 0° and 760 mm. was found to be 0·0014290, and the coefficient of expansion, between 10° and 37°, 0·003674 at 730 mm. pressure.

In the case of hydrogen, the rapid diffusion of gas through the capillary was found to introduce an error into the density measurements. This can be eliminated by making weighings when hydrogen is passing through the containing tube at different rates, and extrapolating the results to the stationary condition. It is shown that this method yields satisfactory results, and that the density found for hydrogen agrees with Morley's value.

H. M. D.

Determination of Degree of Molecular Association in Liquids. ALEXIUS BATCHINSKI (*Zeitsch. physikal. Chem.*, 1911, 75, 665–673. Compare Abstr., 1902, ii, 444).—It is shown that the familiar Ramsay-Shields' formula, $\gamma(xMv)^{2/3} = 2\cdot12(T_k - T - 6)$, for determining the molecular complexity of liquids from measurements of surface tension requires a correction which can be made by substituting for T_k the magnitude T_m , the "metacritical temperature" already defined by the author (*loc. cit.*). The metacritical temperature can be obtained from the results of viscosity measurements by means of the equation: $T_m[\rho_k/(\eta T^3)^2]^{1/7} = 16\cdot31$, where ρ_k is the critical density and η the viscosity at the absolute temperature T . When the critical density is not known, the density at 0°, ρ_0 , may be used; the formula then becomes $T_m[\rho_0/(\eta T^3)^2]^{1/7} = 19\cdot4$. By means of these formulae the molecular complexities of methyl and ethyl alcohols, acetic acid, and water have been calculated.

G. S.

Surface Tension of Solutions of Salts in Alcohol. IVAR W. CEDERBERG (*J. Chin. Phys.*, 1911, 9, 3–14).—The surface tension of purified alcohol and of alcoholic solutions of sodium bromide, sodium iodide, and potassium acetate was determined from the capillary rise in tubes of Jena glass. Care was taken to maintain the temperature constant and to compensate for evaporation of solvent during the determinations.

The surface tension of alcohol is increased by each of the salts, the bromide being most effective and the acetate least. The increase is relatively rapid with the first additions of salt, but afterwards falls,

and becomes a linear function of the salt added when the concentration of the latter is more than about 0·3 mol. per litre.

The highest surface tension observed was 22·93 dynes with a solution of 0·9381 mol. of sodium iodide per litre. The increment, 1·72 dynes, is the same as that produced in water by 0·94 mol. of sodium chloride per litre.

Quincke found (1877) that lithium chloride and calcium chloride increase the surface tension of alcohol in proportion to their concentration, but his measurements were made before the sources of error in capillary rise determinations had been studied by Volkmann.

R. J. C.

Degree of Dispersity and Viscosity. H. W. WOUDSTA (*Zeitsch. Chem. Ind. Kolloide*, 1911, **8**, 73—80).—The influence of the degree of dispersity of the disperse phase on the viscosity of colloidal solutions of ferric and chromic hydroxides has been investigated. On addition of successive small quantities of electrolytes, the viscosity diminishes at first, attains a minimum, and afterwards increases. Small quantities of a non-electrolyte, such as sucrose, have no influence on the viscosity. When the colloidal solutions are kept at 45°, a gradual diminution in the viscosity is observed both in presence and absence of electrolytes. Continued shaking of the colloidal solutions has no measurable effect on the viscosity. Since addition of electrolytes, rise of temperature, and shaking reduce the degree of dispersity of the hydrosol, it is supposed that the changes in viscosity are dependent on the changes in the character of the disperse phase. For small variations in the degree of dispersity, the viscosity diminishes, whereas the formation of much larger particles results in an increase of viscosity.

H. M. D.

Balling together Phenomena. J. HERTKORN (*Chem. Zeit.*, 1911, **35**, 89).—The various phenomena in connexion with the balling-together of precipitates (this vol., ii, 98) are readily explained by the convection currents set up by the difference in temperature between the liquid in which the precipitate is suspended and the surrounding atmosphere.

T. S. P.

Adsorption of Neutral Salts. HILARY LACHS and LEONOR MICHAELIS (*Zeitsch. Elektrochem.*, 1911, **17**, 1—5).—It is first shown that potassium and sodium chlorides are adsorbed (from aqueous solutions) by blood charcoal in a normal way (the quantity adsorbed per gram of charcoal is nearly proportional to the square root of the equilibrium concentration of the salt) and that the cation and anion are adsorbed in equivalent quantities. The adsorption is not affected by the addition of acetone, amyl alcohol, or phenol to the solution, and, conversely, the adsorption of these substances is not affected by the presence of the salts. On the other hand, the addition of a salt (sodium or potassium nitrate or sodium sulphate) to the solution diminishes the quantity of the chloride adsorbed in a very marked way.

The addition of a basic substance (sodium or potassium hydroxide,

ammonia, sodium carbonate, trisodium phosphate) to the solution prevents the adsorption of chlorine ion altogether, whilst acids have the opposite effect. This effect of acids is not entirely dependent on the hydron, but depends also on the nature of the anion. Sulphuric and phosphoric acids were the most active of those tried, nitric acid had but little effect, and the halogen hydriacids diminished the adsorption instead of increasing it.

The authors draw the conclusion that whilst the adsorption of non-electrolytes is probably due to changes of surface tension, that of electrolytes must be ascribed to some different cause, probably of electrical origin.

T. E.

Adsorption Experiments. K. SCHERRINGA (*Chem. Weekblad*, 1911, 8, 11-12).—The author describes experiments on the diminution of the lead content of lead solutions by contact with paraffin-wax, and states that the amount of lead abstracted from the solutions is independent of the surface area of the wax. His inference is that the action is due to solution and not to surface condensation.

A. J. W.

Ostwald's Dilution Law. JAN ŠEBOR (*Zeitsch. physikal. Chem.*, 1911, 75, 685-686).—It is shown mathematically that the dilution law is only valid when no reaction takes place between the electrolytes in the mixture.

G. S.

Relation of Osmotic Pressure to Temperature. I. Manufacture of the Cells employed in the Measurements. HARMON N. MORSE, WILLIAM W. HOLLAND, JOSEPH C. W. FRAZER, and R. MEARS (*Amer. Chem. J.*, 1911, 45, 91-113). Compare Morse and Frazer, *Abstr.*, 1905, ii, 575).—Morse and Holland (*Abstr.*, 1909, ii, 386) have given an account of measurements of the osmotic pressure of sucrose solutions at 20°, and have compared the results with those obtained at 0°, 5°, 10°, 15°, and 25° (*Abstr.*, 1907, ii, 744; 1908, ii, 671, 1019; 1909, ii, 216). It has been found that within this range of 0—25°, the temperature-coefficient of osmotic pressure in the case of sucrose solutions of concentration from 0·1*N* to *N* is practically identical with that of gas pressures.

The method of investigation has now been further improved, and the work at the six temperatures mentioned has been repeated. The results obtained confirm the conclusion arrived at previously, but a few preliminary experiments with concentrated solutions at 30°, 40°, and 50° indicate that at these higher temperatures the ratio of osmotic to gas pressure does not remain constant, but tends to diminish, beginning at some point between 25° and 30°. A detailed account of the work is to be published in a series of papers, of which this is the first.

A full description is given of the method of manufacturing the cells, including the treatment of the clays, the burning and glazing of the cells, and the mode of attaching the manometer. The cells are glazed, both inside and outside, from the middle upwards. They have been found satisfactory in all respects, except that there is a chance

that dissolved matter may diffuse in between the two glazed surfaces and afterwards affect the pressure measurement by diffusing downwards and distributing itself about the membrane. It is considered probable that the results of the experiments have not been vitiated in the slightest degree by this defect, but efforts will be made to obviate the risk by making a cell half porous and half porcelain.

E. G.

Theory of the Isoelectric Point. LEONOR MICHAELIS and HEINRICH DAVIDSOHN (*Biochem. Zeitsch.*, 1910, **30**, 143—150).—In previous papers (Abstr., 1910, ii, 592, etc.) it has been shown by experiments with protein solutions that the so-called isoelectric point and the point of optimum coagulation coincide. The acidic and basic dissociation constants of these proteins are, however, not known, and experiments have now been made with simpler compounds for which both dissociation constants are known. The rate of crystallisation from fairly concentrated solutions of these electrolytes in *N/1*-sodium hydroxide to which different proportions of acid had been added was observed; the hydrogen concentration of the solution showing the maximum crystallisation velocity was determined by *E.M.F.* measurements, and the H^+ ion concentration, J , at the isoelectric point thus obtained compared with that calculated by means of the formula $J = \sqrt{K_a K_w K_b}$, where K_a and K_b are the acidic and basic dissociation constants of the electrolyte, and K_w is the ionic product for water.

With *m*- and *p*-aminobenzoic acids there is excellent agreement between the observed and calculated values of J , with aspartic acid the agreement is moderate, with theobromine unsatisfactory, and with arsenious acid the velocities of crystallisation were so irregular that no definite results were obtained.

G. S.

Ideal Solutions. L. GAY (*J. Chim. Phys.*, 1911, **9**, 103—104).—Polemical. Criticism of a recent paper by Washburn (Abstr., 1910, ii, 1044).

R. J. C.

Transference and Transformations of Energy with Applications to the Theory of Solutions. MADISON M. GARNER (*J. Physical Chem.*, 1911, **15**, 20—44. Compare Abstr., 1910, ii, 935).—The second law of thermodynamics may be enunciated thus: "In an isolated system work or potential energy appears only during the spontaneous transfer of energy from points of higher to points of lower intensity, accompanied by an equilibrating of the various energy intensities." All natural processes are equilibrating processes, during which each type of energy independently tends to become uniformly distributed.

Equilibrium may be established between a solution and the pure solvent by (1) raising the temperature of the solution until its vapour pressure equals that of the solvent, or (2) raising the level of the solution so that the difference in vapour pressures is compensated by the higher barometric pressure of the vapour on the solvent, or (3) increasing the pressure on the solution. If any two of these conditions are prevented, the spontaneous transfer of solvent vapour to

the solution will establish the third. The solution is therefore in a state of less potential (free) energy than the pure solvent at the same temperature, although the energy per molecule is unchanged. If it is assumed that dissolution entails no chemical union, but merely the distribution of the energy of the N -molecules of solvent among the $(N+n)$ molecules of solution, the abs. temperatures before and after dissolving the solute should be as $(N+n):N$. The fall in temperature on dissolving 1 gram-mol. of sucrose in a litre of water at 20° would be 5° instead of the actual 0.8° . The difference must be supplied by chemical union with a decrease in the number of reacting molecules and the liberation of a definite amount of energy.

R. J. C.

The Critical Phenomena of Dissolution of Mixtures with Normal Components Examined under Variable Pressure. JEAN TIMMERMANS (*Proc. K. Akad. Wetensch. Amsterdam*, 1910, 13, 507—526).—The influence of pressure on the critical solution temperature has been investigated for mixtures of cyclohexane and aniline (31.05°), nitrobenzene and hexane (21.00°), and nitrobenzene and isopentane (32.20°). For the first pair of liquids the critical solution temperature rises with increase of pressure, the rise per atmosphere being about 0.0065° . For the other two pairs the temperature falls with increase of pressure, the fall per atmosphere decreasing as the pressure becomes greater. In the case of a mixture of nitrobenzene and hexane, dt/dp is equal to 0.0186° at low pressures, and 0.0122° at 220 atmospheres. For a mixture of nitrobenzene and isopentane, dt/dp is equal to 0.0413° at low pressures and 0.0200° at 250 atmospheres.

H. M. D.

Crystallisation from Aqueous Solutions. V. Adsorption by Crystals. ROBERT MARC (*Zeitsch. physikal. Chem.*, 1911, 75, 710—732. Compare Abstr., 1909, ii, 798, 983; 1910, ii, 834).—In connexion with the observation that the presence of dyes retards the velocity of crystallisation, the equilibrium between certain crystals and dyes in solution has now been systematically investigated. As dyes, methylene-blue, Bismarck-brown, methyl-violet, andponceau-RR, and as adsorbing surfaces, crystals of uric acid, barium sulphate, and barium and strontium carbonates were used.

It is shown that the colouring of crystals is an adsorption phenomenon, and follows the well-known exponential law $a = kl^{1/n}$, where a is the amount adsorbed by a definite surface, l is the concentration of the dye in the solution, and k and n are constants. With different substances the values of $1/n$ vary between $1/3$ and 1 . Further, for every crystalline substance with definite surface, there is an upper limit of saturation, beyond which a no longer increases as l is increased. The bearing of the saturation limit on the phenomena of crystallisation from coloured solutions is discussed in detail.

The same crystal does not adsorb to the same extent on all its surfaces, and in this connexion it is shown generally that the ratio in which the different dyes are adsorbed does not depend on the chemical nature of the adsorbent, but on the crystallographic nature of the adsorbing surface.

G. S.

Crystallisation through Membranes. JAMES H. WALTON, jun. (*J. Physical Chem.*, 1911, 15, 45-53. Compare *Abstr.*, 1909, ii, 649).—Supercooled phosphorus, which crystallises at a speed of 60(9) mm. per minute, cannot transmit its crystallisation through gold-beater's skin, or through 0.003 in. of rubber, although salol with a crystallisation speed of only 4 mm. per minute is able to pass its solid phase through these membranes. Aqueous supersaturated solutions of sodium acetate, potassium alum, and lead acetate are unable to crystallise through rubber membranes 0.003 to 0.004 in. thick. The necessary contact with the solid phase is not established unless the membrane is wetted by the solvent as in the case of aqueous solutions with parchment or collodion. In order that an aqueous solution shall crystallise through either of these membranes, a definite minimum degree of supersaturation is necessary, depending on the particular salt and membrane. Potassium alum appears to pass through parchment less readily than through collodion, and the reverse holds for sodium acetate. The author suggests that there is a concentration of the water in the pores of the membrane, so that in order to produce a saturated solution in the membrane, a definite degree of supersaturation is necessary outside it. R. J. C.

Solid Colloidal Solutions. ALFRED LOTTERMOSER (*Zeitsch. Chem. Ind. Kolloide*, 1911, 8, 95-96).—In reference to the views of Benedicks on the nature of troostite (this vol., ii, 25), the author calls attention to the similarity between the phenomena which are observed in the slow and rapid cooling of iron carbon alloys on the one hand, and gold glasses on the other. H. M. D.

Emulsion Colloids (Emulsoids) and Observations on the Methods of Counting Ultra-microscopic Particles. GEORG WIEGNER (*Koll. Chem. Beihefte*, 1911, 2, 213-242).—It has been found that independent estimations of the number of ultra-microscopic particles in a solution of colloidal gold, carried out by different observers at different times, exhibit discrepancies such as can be entirely accounted for on the basis of the law of probability.

Experiments are described which show that olive oil-water emulsions can be prepared by means of a Laval emulsifier which contain as many as $5 \cdot 10^9$ colloidal particles in 1 c.c. Emulsoids containing from 2 to $3 \cdot 10^9$ particles per c.c. are quite stable, but those containing a larger or a smaller number of particles are comparatively unstable.

The olive oil-water emulsoids exhibit the characteristic properties of colloidal solutions. Coagulation takes place on addition of electrolytes. Corresponding with the fact that the emulloid particles are negatively charged, it is found that acids cause coagulation even in very dilute solution. In very small quantities (less than 25 millimols. per litre), hydroxides have no effect, but above this limit the activity of hydroxides exceeds that of acids. This is attributed to the greater readiness with which the OH⁻ ions are adsorbed as compared with the H⁺ ions.

In presence of egg-albumin, coagulation takes place more readily, and

this is supposed to be an effect of the same kind, although opposite in sign, as that which is involved in the action of protective colloids.

H. M. D.

Some General Properties of the Binary Equilibrium Diagram. KARL BORNEMANN (*Metallurgie*, 1910, 7, 740—747).—Complete immiscibility of the components in two co-existing phases is impossible, and every homogeneous field of the equilibrium diagram must therefore have a certain extension in the direction of the axis of concentration. As two co-existing saturated phases cannot have the same composition, the heterogeneous field separating these two phases must also have a definite extension in the same direction. These rules apply to all systems which are not in invariant equilibrium. Their effect on the diagram is illustrated by application to the nickel-sulphur system (Abstr., 1910, ii, 1072).

C. H. D.

The Analysis of Binary Compounds by a Method Based on the Law of Mass Action. IWAN OSTROMISSLINSKY (*Ber.*, 1911, 44, 268—273).—It is shown that if two substances, *A* and *B*, unite to form an unstable compound, and if varying amounts represented by *a* and *b* (in gram-mols.) of the two are mixed in solution so that *a*+*b* is always constant, then the maximum yield of the compound is formed when the two components are present in the proportions in which they combine with one another. The maximum yield of compound can be determined by some physical method, such as change in colour. It is shown that in the case of aniline and nitrobenzene, a definite compound of molecular proportions of the components is formed in the absence of a solvent. The coloration was determined with a Krüss spectrophotometer, using an incandescent gas lamp and a thickness of liquid 10 mm., at 22—23°.

The formula $a/s.(9M+3M')/R$ can be used for calculating the relative amounts of product in the solution when $a+b=12$ and $a/b=3$. *M* and *M'* represent the mol. wts. of the two components, *S* the sp. gr. of the mixture, and *R* the proportionality factor. J. J. S.

Equilibrium Diagram of Silver Iodide. GUSTAV TAMMANN (*Zeitsch. physikal. Chem.*, 1911, 75, 733—762).—In a previous paper (*diss. Phys. Chem.*, 1899, [ii], 68, 643) evidence was obtained that three solid forms of silver iodide exist. As a result of the present investigation, this conclusion is confirmed, the three forms being silver iodide, I, the ordinary yellow modification; II, a red modification, and III, which is only stable when the pressure exceeds 3000 kilog./cm.².

The equilibrium curves I—III and I—II have been determined in detail, and also the position of the triple point at which the three forms are in equilibrium; the latter point lies at 100° and 2940 kilog. pressure. The change of volume when modification I changes to the denser form III is about 0·0265 c.c. per gram, whereas the converse change from III to I is attended by an expansion of only 0·0233 c.c. per gram. The cause of this discrepancy is so far undetermined. The average change of volume in changing II to III is about 0·0115 cm. per gram. The velocity of transformation of I to III, and vice

versà, does not take place like a system of one component, for example, like the transformation ice I—ice III. In the range of temperature from 90° to 20° the transformation I—III takes place at a definite pressure, which only depends on the rate of change of volume; in the converse transition III—I, the maximum velocity is reached at 2700 kilog./cm.², practically independent of the temperature. At the end of the transformation I—III, the pressure must exceed 3200 kilog. in order to complete the change; similarly, to complete the converse transformation, the pressure must be very considerably lowered. As an explanation of these peculiarities it is suggested that both I and III form saturated mixed crystals, the composition of which depends on the temperature and pressure.

When III is cooled to -80° and the pressure reduced, the change III—I occurs at 1700 kilog. pressure, but when the same form is cooled to -180°, the transformation does not occur even at 1 kilog. pressure.

In the course of the investigation it was shown that the precipitated, so-called amorphous silver iodide is identical with the crystalline modification.

G. S.

Mixed Crystals in Liquid-Crystalline Systems and the Phase Rule. ADA PRINS (*Zeitsch. physikal. Chem.*, 1911, 75, 681—684).—An answer to the criticisms of Lehmann (*Abstr.*, 1910, ii, 772) on the author's work (compare *Abstr.*, 1909, ii, 869). The importance of quantitative observations as opposed to purely qualitative microscopic observations is emphasised.

G. S.

Periodic Reactions. JULIUS HIRNIAK (*Zeitsch. physikal. Chem.*, 1911, 75, 675—680. Compare Lotka, *Abstr.*, 1910, ii, 401).—It is shown mathematically that under certain conditions a periodic chemical reaction may occur in the unimolecular reversible transformation of three isomerides.

G. S.

Speed of Reaction in Heterogeneous Systems. J. BOSELLI (*Compt. rend.*, 1911, 152, 256—259).—The following conclusions, derived from theoretical considerations to be published hereafter, refer to that particular type of reaction illustrated by the dissolution of magnesia in dilute hydrochloric acid, a case in which the velocity of reaction depends on the rate of diffusion of the acid towards the solid.

(1) The velocity of dissolution or vaporisation of a solid in a liquid is proportional, other conditions being equal, to a power, slightly less than the 4/3, of the difference between the mean concentration of the dissolved solid at an infinitely small distance from the undissolved surface, and its average concentration in the solution. The velocity is also proportional to the 1/3 power of the coefficient of diffusion of the solute in the solvent.

(2) The speed of dissolution is proportional to the square root of the coefficient of diffusion, to the square root of the velocity of the stream of liquid (moving uniformly in a straight line), and to the difference between the concentration at saturation and the average concentration.

(3) The following expressions indicate the speed of total dissolution, Q , of a rectangular plate (dimensions $l \times y$) and of a circular plate, radius R , respectively, each being parallel to the flow of liquid:

$$Q = 2By\sqrt{VK/\pi}; \quad Q = 2^2R^2\sqrt{VK/\pi}Bf_0(1 - \alpha^2)^{1/2}da.$$

K is the coefficient of diffusion, V the velocity of the liquid, and B the difference between concentration at saturation and mean concentration.

These expressions have an advantage over those of Nernst, inasmuch as they contain no arbitrary constant.

W. O. W.

Comparison of Reaction Velocity and the Fluidity of the Medium. ERNEST S. GRUMELL (*J. Chim. Phys.*, 1911, 9, 143—159).—The rates of hydrolysis of sucrose and ethyl acetate by hydrogen chloride have been compared with the viscosities of the same solutions at various temperatures from 0° to 98°. In neither case does the progress of the hydrolysis introduce any appreciable change in the viscosity of the solutions.

No quantitative relation between viscosity and chemical activity could be traced, and the introduction of solubility considerations in the case of sucrose led to no better result.

The coefficients of increase of velocity and decrease of viscosity with temperature both show a diminution as temperature rises. The ratios of the temperature-coefficients of velocity and viscosity at any temperature were appreciably constant in both reactions. This is held to demonstrate a connexion between the phenomena. It is suggested that connexion is to be sought in Trautz' hypothesis (Abstr., 1909, ii, 651), according to which the variations in the temperature-coefficient of reaction velocity are due to changes in the specific heat of the solution, to which also the viscosity is closely connected. R. J. C.

The Velocity of the Ring Opening in Connexion with the Composition of the Unsaturated Ring Systems. JACOB BOSEKEX and A. SCHWEIZER (*Proc. K. Akad. Wetensch. Amsterdam*, 1910, 13, 534—536).—The rates of hydration of succinic and maleic anhydrides have been compared at 0° by means of measurements of the electrical conductivities of the aqueous solutions. The observed rate of change indicates that the reaction is unimolecular, and that maleic anhydride takes up water 14·2 times as fast as succinic anhydride (compare Rivett and Sidgwick, *Trans.*, 1910, 97, 1677). H. M. D.

Repeating Figures in the Atomic Weight Values. HERMANN LOEWEN (*Chem. Zeit.*, 1911, 35, 55).—A severe adverse criticism of Lorinc's suggestion (compare Abstr., 1910, ii, 1053) that there is some significance in the occasional recurrence of the figure in the unit's place in the second place of decimals.

G S

Atomic Weight Relations. F. H. LORINC (*Physikal. Zeitsch.*, 1911, 12, 107—112).—The paper consists mainly of tables and curves illustrating relationships between the atomic weights, some of which have already been given in previous papers (compare Abstr., 1909, p. 392, 562, 715; 1910, ii, 26). The inactive gases are supposed to be

formed by the association of acid and basic principles, and a number of methods of arriving at their atomic weights on this basis are indicated. The atomic weights of these elements are also derived by a geometrical method. In the course of the investigation, the atomic weights of a number of elements so far unknown are deduced.

G. S.

Periodic System [of the Elements]. CURT SCHMIDT (*Zeitsch. physikal. Chem.*, 1911, **75**, 651—664).—The author considers that the weaknesses of Mendeleeff's classification of the elements can be avoided by dividing the elements into four groups which are genetically connected. The first group comprises hydrogen, certain gases present in stars, and "proto-metals." The second group consists substantially of the members of the even series of Mendeleeff's table, which are characterised by pronounced chemical individuality and the division into metals and non-metals, separated by a neutral zone of inactive gases. The third group, which consists mainly of the uneven series of Mendeleeff's table, consists of metals only, and the members form no definite chemical compounds among themselves, but merely alloys. The fourth group comprises the metals of the rare earths.

The advantages of this system of classification, and the possible stages in the genesis of the elements, are discussed in detail. Finally, as regards tendencies now at work, the development is towards the elimination of chemical differences, and therefore towards the disappearance of chemical affinity. This is brought about by the formation of systems of elements, the members of which become chemically more alike and finally identical.

G. S.

Helix Chemica. Study of the Periodic Relations of the Elements and Their Graphic Representation. BENJAMIN K. EMERSON (*Amer. Chem. J.*, 1911, **45**, 160—210).—The elements have been arranged in the form of a spiral based on the idea of Crookes' spiral (*Trans.*, 1888, **58**, 503). The curve begins with "der Urstoff" or ether with valency and density of zero. From this an initial half-circle rises with coronium at its summit. The second curve is a half-octave circle passing from hydrogen through nebulum and "proto-fluorine" to helium (compare Jessup and Jessup, *Abstr.*, 1908, p. 76). This is followed by two octave circles in which the elements rise through lithium to carbon, rise through fluorine to neon, and sink through sodium to silicon and on through chlorine to argon. The spiral is continued by four double-octave circles, and terminates in a quadruple octave. The first double octave begins with potassium and ends with krypton; the second begins with rubidium and ends with xenon; the third begins with caesium and ends with an unknown element; the fourth begins with an unknown element and ends with "radium emanation." The quadruple octave contains radium, ionium, thorium, and uranium.

The position of the elements in the spiral are correlated with the atomic weights, densities, valencies, refractivities, specific volumes, compressibilities, electropotential relations, crystallographic forms, fusibilities, volatilities, hardness, ductility, and other properties.

E. G.

The paper is illustrated with numerous diagrams.

The State of Aggregation of Matter. I.—III. SAMUEL R. SCHRYVER (*Proc. Roy. Soc.*, 1910, *B*, **83**, 96—123).—See this vol., i, 245.

The History of the Name “Gas.” EDMUND O. VON LIPPmann (*Chem. Zeit.*, 1911, **35**, 41—43, 62—64, 70—72).—Historical.

L. DE K.

Congress of Chemists at Karlsruhe in 1860. ERNST VON MEYER (*J. pr. Chem.*, 1911, [ii], **83**, 182—189).—Historical.

C. S.

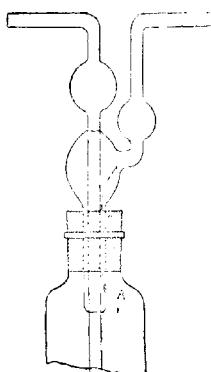
Gas Regulator for Thermostats. ARTHUR SLATOR (*J. Soc. Chem. Ind.*, 1911, **30**, 61—62).—The part of the regulator containing the mercury is provided with a side-tube which is bent slightly downwards close to the junction and then rises vertically. By means of a glass rod fitted into the upper end of this side-tube, the level of the mercury in the main tube may be regulated as desired, the rod being moved up or down for this purpose. The rod passes through a rubber stopper fitted in a cup at the top of the tube, and this cup is filled with a mixture of glycerol and water.

W. P. S.

New Form of Constant Temperature Drying Oven. RAYMOND L. SIAU (*J. Soc. Chem. Ind.*, 1911, **30**, 64).—The oven consists of a round or square cylinder mounted horizontally and surrounded by a jacket of similar shape. The jacket is united to the cylinder at one end, and this end of the oven is closed by means of a closely-fitting door. Steam, or the vapour of any other liquid, is admitted to the jacket, which is provided with a condenser; and a current of air is drawn through the oven itself, this air, before entering the oven, having been passed through a spiral tube situated in the jacket and surrounding the cylinder forming the oven. A tube, leaving the oven at the opposite end to the door, is connected with a pump in order to draw the current of heated air through the spiral tube and oven.

W. P. S.

Cheap Crucible Supports. VON HEYNDORFF (*Chem. Zeit.*, 1911, **35**, 139).—The disused fire-clay supports of inverted incandescent mantles will be found suitable for supporting red-hot crucibles either on the bench or in a desiccator.



A Closing Contrivance for Gas-washing Bottles, Wash-Bottles, etc. FRANZ MICHEL (*Chem. Zeit.*, 1911, **35**, 72).—The arrangement (see Fig.) renders unnecessary the use of stopcocks or pinch-cocks, and allows the current of the gas to be regulated or to be shut off. All that is necessary is to move the bulb-tube upwards or downwards in the cork, so as to partly or totally close the opening *A*.

The same principle may be applied to ordinary wash-bottles.

L. DE K.

A New Gas-generating Apparatus. FRANZ MICHEL (*Chem. Zeit.*, 1911, **35**, 52).—An Improved Kipp Apparatus.—An exit tube for the gas generated is fused on to the neck of the lower vessel. Corresponding in position with this, a groove is cut in the upper vessel where it is ground into the neck of the lower vessel, so as to form a passage from the lower vessel to the exit tube. On rotating the upper vessel this passage is closed, thus replacing the usual external stopcock on the exit tube.

L. DE K.

Inorganic Chemistry.

Influence of Organic Liquids on the Interaction of Hydrogen Sulphide and Sulphur Dioxide. DAVID KLEIN (*J. Physical Chem.*, 1910, **15**, 1—19).—Dry hydrogen sulphide will not react with dry sulphur dioxide (Cluzel, *Ann. Chim. Phys.*, 1812, **84**, 162). Brereton Baker has recently stated that liquid alcohol and liquid sulphur dioxide can liberate sulphur from the dried mixture of gases, whereas carbon tetrachloride is inert (*Mem. Manchester Phil. Soc.*, 1909, **53**, Part 3). The author's experiments confirm and extend these observations.

Immediate action is produced by water, ethyl alcohol, isobutyl alcohol, isomethyl alcohol, acetone, propyl acetate, benzaldehyde, and carvone. A slower decomposition occurs with methyl ethyl ketone, acetonitrile, propionitrile, valeronitrile, phenylacetonitrile, methyl benzoate, isobutyl acetate, and ethyl ether. On the other hand, carbon disulphide, ethyl disulphide, benzene, amylene, chloroform, nitrobenzene, acetyl chloride, benzoyl chloride, ethyl chloride, and carbon tetrachloride are quite inert. There appears to be no connexion between the dielectric capacity or association factor of a liquid and its activity as a catalyst in this reaction. Many of the active liquids are known to form compounds with hydrogen sulphide, notably the nitriles, the aldehydes, and carvone. The results generally support the intermediate compound theory of catalysis.

Care was taken to eliminate water as far as possible from the mixed gases and the various solvents, but it is admittedly impossible to prove that water was entirely absent in those cases where action occurred.

R. J. C.

Nitrosulphonic Acid: "Blue Acid". FRITZ RASCHIG (*Zeitsch. angew. Chem.*, 1911, **24**, 160). Compare Abstr., 1910, ii, 1055. T. S. F. Polemical. A reply to Manchot (this vol., ii, 107).

Tellurium. ALEXANDER GUTBIER and FERDINAND FLURY (*J. pr. Chem.*, [ii], 83, 145—163).—See this vol., i, 182.

Action of Hydrazine Hydrate on Sodamide. ROBERT STOLLÉ (*J. pr. Chem.*, 1911, [ii], 200).—Almost anhydrous hydrazine is obtained by distilling sodamide and hydrazine hydrate in a vacuum (compare Raschig, *Abstr.*, 1910, ii, 706). The quantity of sodamide must be rather smaller than that calculated from the equation : $N_2H_4 \cdot H_2O + NH_2Na = N_2H_4 + NH_3 + NaOH$; when an excess is used, a violent explosion occurs at about 70° , probably due to the formation and decomposition of sodium hydrazide (compare Ebler, *Abstr.*, 1910, ii, 614).

C. S.

Experiments on the Inertness of Oxygen towards Phosphorus. MIECZYSŁAW CENTNERSZWER (*Chem. Zeits.*, 1910, ii, 1022; from *Kosmos*, 1910, 35, *Rudziszewski-Festbau*, 526—527).—The author determined the partial pressure of oxygen at which luminosity commences in solutions of phosphorus in castor oil, petroleum, and vaselin oil between 0° and 25° . He also measured the speed of oxidation of phosphorus in castor oil at 25° . The experiments show that the apparent inertness of phosphorus for oxygen occurs also in solutions of phosphorus, and that with the decreasing partial pressure of the phosphorus the luminosity pressure decreases for the oxygen. It is also shown that by the solution of phosphorus in non-volatile oils its oxidation power is increased. During the oxidation of phosphorus an unknown compound is formed, which inhibits the oxidation process autocatalytically; this compound is evidently identical with that which inhibits the oxidation of solid phosphorus by oxygen at atmospheric pressure.

N. C.

Density of Hydrogen Phosphide and Atomic Weight of Phosphorus. G. TER-GAZARIAN (*J. Chim. Phys.*, 1911, 9, 101—102).—Replying to the criticism of Baxter and Jones (*Abstr.*, 1910, ii, 288), the author contends that the hydrogen phosphide used in his atomic weight determinations could not have been contaminated with hydrogen and ammonia. Some error may, however, have been introduced by calculating the compression constants from the critical data instead of from the compressibility of the phosphide.

R. J. C.

The Volatile Matter of Coal. HORACE C. PORTER and F. K. OVITZ (*Bull. Bureau of Mines*, 1910, I, 1—56).—Nine different coals from various parts of the United States have been investigated with a view to determining the composition of the volatile products evolved at different temperatures. The by-products of coking were determined by tests in an iron retort on 400 grams of coal, whilst the gas evolved was determined by tests on 10 grams of coal, using a platinum retort. The furnace temperatures varied from 500 — 1100° .

The main features of the results are the comparatively large amounts of inert constituents, such as carbon dioxide and water, in the products from certain western coals, the large amounts of higher

methane hydrocarbons, such as ethane, in the products obtained at moderate temperatures, particularly from the Appalachian coals, and the larger amounts of gas and tarry vapours produced quickly at moderate temperatures from the younger western coals. The bearing of these results on smoke-producing tendencies, on studies of the nature of coal substance, and on the calculation of heat value from ultimate analysis is discussed.

Any statement as to the character of the gases or volatile products evolved from coal at specified temperatures has little value, unless it is accompanied by a clear description of the conditions prevailing during the testing, and particularly of the points at which temperatures were taken, and of the mass of coal which was heated. The temperature varies throughout the mass, and is affected by the rate and time of heating. The same temperatures outside the containing vessel produce different temperatures in the coal itself according to the kind of vessel and the duration of heating. The distance of the vessel from the point where temperatures are read influences the difference between the observed temperature and that of the coal within the vessel.

T. S. P.

Fractional Crystallisation and Atomic Weight of Argon.
FRANZ FISCHER and VICTOR FRONSESE (*Ber.*, 1911, 44, 92—104).—The discrepancy in the periodic arrangement of the elements which occurs with the pair argon and potassium is due very probably to an error in the atomic weight of argon. The authors have therefore tested the individuality of this element by a process of fractional crystallisation. An apparatus for this purpose is figured and described; the most important part is the fractionating vessel, which is designed to effect a separation of the liquid and the solid phases at any pressure, and in the complete absence of air. Forty litres of argon, D 19.94 isolated from air by the aid of glowing calcium carbide (Fischer and Ringe, *Abstr.*, 1908, ii, 688; Fischer and Hähnel, *Abstr.*, 1910, ii, 698) are used. Argon has b. p. —186.9°/760 mm., and f. p. —189.6°, and its freezing and thawing by the aid of freshly-prepared liquid air, b. p. about —191°, and of stored liquid air, b. p. about —184°, is a practical operation.

The experiments show that argon cannot be separated into two fractions of different density by fractional crystallisation; the densities of the gaseous argon obtained from the liquid and the solid phases are both 19.95(4), corresponding with an atomic weight of 39.9. In some experiments fractions have been obtained having D 19.86; the depression is due to the presence of neon and air; for when the latter is removed by chemical means the density is increased to 19.92.

C. S.

Isotherms of Monatomic Gases and of their Binary Mixtures. VI. Co-existing Liquid and Vapour Densities of Argon; Calculation of the Critical Density of Argon.
C. A. CROMMELIN (*Proc. K. Akad. Wetensch. Amsterdam*, 1910, 13, 607—613).—From the data obtained in a previous investigation (*Abstr.*, 1910, ii, 709), the author has calculated the differences

between the densities of liquid and gaseous argon at a series of temperatures. By combination of these differences with the sum of the densities as represented by the law of rectilinear diameters, values have been obtained for the density of both liquid and saturated vapour. The respective densities are 1·0268 and 0·1073 at -140·8°, 0·9339 and 0·1621 at -134·72°, 0·8581 and 0·2079 at -129·83°, and 0·7557 and 0·2843 at -125·49°. It is shown that the observations can be satisfactorily represented by means of Keesom's formula,

H. M. D.

Isotherms of Monatomic Gases and of their Binary Mixtures. VII. Isotherms of Argon between +20° and -150°. H. KAMERLINGH ONNES and C. A. CROMMELIN (*Proc. K. Akad. Wetensch. Amsterdam*, 1910, 13, 614-625).—The pressure volume relationships of argon have been determined at temperatures between +20° and -150° for pressures ranging up to 60 atmospheres.

H. M. D.

Precipitation of Soluble Chlorides by Hydrochloric Acid. JOHN GIBSON and ROBERT B. DENISON (*Proc. Roy. Soc. Edin.*, 1909-10, 30, 562-568).—From the point of view of the dissociation theory the precipitation of sodium chloride from solution by the addition of hydrochloric acid is due to decrease in the dissociation of the salt, and consequent increase in the concentration of the undisociated molecules. Precipitation should occur, therefore, only when the concentration of the chloride ions in the solution of hydrochloric acid is greater than the concentration of the chloride ions in the saturated solution to which it is added.

Experiments at 18° with saturated solutions of sodium, potassium, rubidium, and ammonium chlorides, and at 0° with saturated solutions of sodium and potassium chlorides, showed that precipitation occurred only when the concentration of the hydrochloric acid added was 18-19% or higher, that is, when acid of maximum conductivity was added.

Calculation of the chloride-ion concentrations of the saturated solutions from measurements of the electrical conductivity shows that only in the case of sodium chloride is it less than the concentration of the chloride ion in hydrochloric acid of maximum conductivity, so that if the explanation mentioned above is the correct one, the ionic concentrations calculated from the electrical conductivities cannot be even approximately correct.

Even if the concentration of the chloride ions is at least equal to that of the saturated salt solutions, there is no explanation as to why such solutions, which are all precipitated by hydrochloric acid of the same concentration, are in no case precipitated by a solution containing less hydrogen chloride.

The insufficiency of the dissociation theory to explain these phenomena is probably due to its taking into account only the following equilibria: solid salt \rightleftharpoons undisociated salt in solution + Cl^- ions, whereas probably there are other factors, such as the hydration of the ions and undisociated molecules, and the formation of complex ions.

The above experiments are further instances of a tendency toward maximum specific conductivity in chemical reactions (compare Abstr. 1897, ii, 437; 1900, ii, 198); the hypothesis of such a tendency thus shown to be useful, for by it the conditions necessary for the precipitations are correlated and were predicted.

T. S. P.

Revision of the Atomic Weight of Calcium. II. Analysis of Calcium Chloride. THEODORE W. RICHARDSON and OTTO HÖNSCHMID (*Monatsh.*, 1911, 32, 41—51.* Compare Abstr., 1902, ii, 3 and this vol., ii, 112).—The calcium chloride was prepared from calcite carbonate and hydrochloric acid, and was subjected to three recrystallisations. The calcium carbonate was from two different sources. The first specimen was prepared from calcium nitrate by precipitation with freshly distilled ammonium carbonate, the calcium nitrate having been obtained from marble and nitric acid, and recrystallised ten times. The second specimen was obtained in a similar manner from a pure specimen of precipitated calcium carbonate, the nitrate being recrystallised six times. Calcium chloride was prepared from each of these specimens of calcium carbonate, and also by concentration of the mother liquor resulting from the recrystallisations; this third specimen of calcium chloride was recrystallised four times.

The calcium chloride used in each determination was fused in a current of hydrogen chloride, and cooled in an atmosphere of nitrogen, finally, of air. It was then analysed by the gravimetric titration method (Abstr., 1910, ii, 292), the chlorine being precipitated by a nitrate prepared from three different specimens of pure silver. A allowance had to be made for any acidity or alkalinity of the calcium chloride. The average of seven determinations gave the $\text{CaCl}_2 : \text{Ag} = 0.514405$, corresponding with 49.074 ± 0.002 , as the atomic weight of calcium [$\text{Ag} = 107.88$ and $\text{Cl} = 35.457$]. This result is considered to be more accurate than those obtained by analysis of calcium bromide (*loc. cit.*). As a mean of all results, the authors consider $\text{Ca} = 40.075$ as the most accurate number.

The Chemical Action of Sea-Water on Portland Cement. PIRSON (Zent. hydraul. Zement, 1910, 1, 151—152).—Experiments in which powdered Portland cement was shaken with solutions of the salts contained in sea-water show that the only compound formed is calcium sulpho-aluminate, $3\text{CaO}\cdot\text{Al}_2\text{O}_3\cdot\text{SO}_4$. Solutions of chlorides react with cement, and form insoluble compounds such as $2(3\text{CaO}\cdot\text{Al}_2\text{O}_3)\cdot\text{CaCl}_2$, but these compounds are rapidly dissolved by solution of sulphates, yielding the sulpho-aluminate. Calcium ferrite forms an insoluble compound, $3\text{CaO}\cdot\text{Fe}_2\text{O}_3\cdot\text{CaSO}_4$.

The Ternary Alloys of Lead, Tin, and Antimony. RÖHRE (Metallurgie, 1911, 8, 7—10, 33—39).—The thermal analysis of the tin-antimony alloys confirms the results of Williams (1907, ii, 783) as to the existence of three series of solid solutions with discontinuities in the freezing-point curve being at 422° and respectively. Thus, two components of the ternary system form solid solutions with one another, whilst the third component does not.

* and J. Amer. Chem. Soc., 1911, 33, 28—35.

form solid solutions with either. The limited miscibility of solid lead and tin may be neglected under the conditions of the investigation.

The freezing-point surface of the space-model is made up of four surfaces, of which three represent the primary crystallisation of the solid solutions of tin and antimony, and the fourth that of lead. There is no ternary eutectic, the lowest point of the surface being the lead-in-eutectic point at 183°. There are two horizontal planes of invariant equilibrium, at 245° and 191°, limiting the regions of stability of the saturated solid solutions. The process of diffusion in the solid alloys is so slow that equilibrium is not readily reached, and small discrepancies are observed between the thermal and microscopical results. The great differences of density between the phases formed also lead much segregation during freezing. The lead in these alloys only plays the part of a solvent, and does not otherwise affect the relations tin and antimony.

C. H. D.

A New Property of Copper and the Rapid Combustion of gases without Flame, or Convergent Combustion. JEAN EUNIER (*Compt. rend.*, 1911, 152, 194—196. Compare Abstr., 1908, 11, 276, 376, 463; 1909, ii, 311).—Copper is able to bring about the flameless combustion of mixtures of coal gas and air at its surface the same way as the metals mentioned in previous communications. The phenomenon may be observed by passing a copper wire into the interior of the luminous flame from a Bunsen burner in such a way that the surface becomes bright by reduction; on allowing air to enter, and pushing the metal into the cool portion of the mixed gases, the fire glows and the flame above becomes green, probably through the formation of a hydride of copper. This property appears to be attributable to the crystalline condition of the metal; electrolytic copper shows it particularly well.

W. O. W.

Colloidal Mercury. CONRAD AMBERGER (*Zeitsch. Ind. Géloïde*, 1911, 8, 88—93).—Colloidal preparations containing about 7% of mercury can be obtained by the reduction of mercurous nitrate in presence of protalbic and lysalbic acids as protective agents. Five grams of sodium protalbate are dissolved in 250 c.c. of water, and sodium hydroxide is added to this solution in quantity somewhat greater than that corresponding with 7 grams of mercurous nitrate. This is also dissolved in 250 c.c. of water acidified with a few drops of citric acid, and the mercurous salt solution is added in successive small portions to the protalbate solution. On addition of excess of hydrazine sulfate to the reddish-brown solution, the mercurous salt is reduced. Citric acid is then added, and the dark brown, flaky precipitate, after washing, is dried in a vacuum at the ordinary temperature. The substance thus obtained is an adsorption compound of solid colloidal mercury and protalbic acid. If the flaky precipitate is dissolved in minimum amount of sodium hydroxide solution before evaporation, a similar absorption compound of colloidal mercury and sodium citrate is obtained.

Experiments are also described which show that colloidal mercury preparations are obtained by the reduction of mercurous nitrate by

means of sodium hyposulphite in presence of sodium protalbate lysalbate as protective colloid. All these preparations appear to quite stable, but coagulation takes place when they are dissolved water. The stability of solutions of the preparations obtained by hyposulphite reduction is, however, relatively much greater than of the preparations which result from the reduction with hydrazine. This is attributed to the presence of colloidal mercuric sulphide, which acts as a second protective colloid.

H. M. D.

Formulae of Aluminium Salts. S. C. J. OLIVIER (*Chem. Weekblad*, 1911, 8, 56-59).—Polemical. A reply to Coops (this vol., 116).

A. J. W.

The Influence of Manganese on the Properties of Steel. GEORG LANG (*Metallurgie*, 1911, 8, 15-21, 49-53).—addition of aluminothermic manganese to iron prepared in an electric furnace, and containing 0·1% of carbon, yields alloys the tenacity a hardness of which increases up to 3% of manganese. The ductility not diminished until the manganese exceeds 1·5%. The electrical resistance is increased, and is independent of the thermal treatment. The magnetic coercive force and hysteresis of iron are increased, and the permeability diminished by the addition of manganese.

C. H. D.

Action of Water Containing Carbon Dioxide on Iron. TH. CLOUS (*Chem. Weekblad*, 1911, 8, 10).—When carbon dioxide passed through a wash-bottle containing water and powdered iron in a sudiometer filled with a concentrated solution of potassium hydroxide until the hydroxide solution is nearly saturated with the gas, a small amount of gas insoluble in the potassium hydroxide is obtained. In the author's experiment, 2·5 c.c. of this gas were collected, and it was proved to be hydrogen by introducing a small amount of oxygen, and exploding the mixture by an electric spark.

A. J. W.

Preparation of the Hydrosol of Tungstic Acid. ARTHUR MÜLLER (*Zeitsch. Chem. Ind. Kolloide*, 1911, 8, 93-95).—Five grams of tungstic tetrachloride are dissolved in about 50 c.c. of a mixture containing equal volumes of ethyl alcohol and ethyl ether, and the filtered solution is then diluted to 250 c.c. with ethyl alcohol. If the solution is mixed with an equal volume of water, a colloidal solution of tungstic acid is obtained, which can be kept for some days without appreciable opalescence being observed. With larger quantities of water, coagulation takes place much more quickly. On addition of small quantities of neutral salts or of hydroxides, coagulation occurs immediately; strong acids produce a similar effect after some minutes, but weak organic acids appear to exert no influence on the stability of the colloidal solutions. Rise of temperature is also without influence, but coagulation takes place if the volume is reduced to about a fourth of the original by evaporation.

When an electric current is passed through the colloidal solution, a deep blue precipitate is formed at the cathode. This is attributed

action of the positively charged colloidal particles by the discharged regen. The behaviour of the colloidal solutions towards electrolytes consistent with the supposition that the tungstic acid is a positive id, and the spontaneous coagulation of the solutions obtained by author's method is probably due to the presence of chlorine ions in solutions.

H. M. D.

Interstitial Uranium. WILLEM P. JORISSEN and A. P. H. TRIVELLI *et al.*, *Weekblad*, 1911, **8**, 59—62. Compare Kohlschütter, Abstr., 1, ii, 598; Jorissen and Ringer, Abstr., 1907, 422, 731; Olie, and Jorissen, Abstr., 1909, ii, 10; Olie, Abstr., 1909, ii, 783).—When allie uranium is exposed to cathode rays, nitrogen is evolved. To attain whether this nitrogen is derived from Kohlschütter's uranium ide, U_3N_4 , a sample of uranium was heated in a vacuum with lead mante. The results indicated the presence in the metal of 0·94% of ogen and 1·25% of carbon. The formula U_3N_4 requires 12·9% of umium.

A. J. W.

A New Uranium Colloid. ALEXANDER SAMSONOW (*Zeitsch. Chem. d. Kolloide*, 1911, **8**, 96—97).—When a solution of uranyl chloride electrolysed, a black precipitate is formed by reduction at the hode. The precipitate is soluble in water, giving a dark-coloured ution which shows the presence of ultra-microscopic particles. A y dilute solution has a yellow tinge, and the absorption spectrum heates that neither a uranous nor a uranyl salt is present. In an etric field the solution becomes decolorised at the anode, and cipitation takes place at the cathode. On addition of electrolytes, ignulation phenomena characteristic of the positive colloids are served.

By titration of the solution with potassium permanganate, before d after reduction with zinc, it has been found that the colloidal sension consists of uranous oxide. The same substance is also tained in the reduction of uranyl chloride by zinc or copper in ate acid solution. Uranochloride acts as a protective, and reases the stability of the colloidal solution.

H. M. D.

Thorium Arsenates. GIUSEPPE A. BARBIERI (*Atti R. Accad. nci*, 1910, [v], **19**, ii, 642—645. Compare Barbieri and Calzolari, str., 1910, ii, 779).—The author has succeeded in preparing two orium arsenates similar in constitution and appearance to the two rium arsenates previously described.

Thorium hydrogen arsenate, $Th(HAsO_4)_2 \cdot 6H_2O$, is precipitated in ysrtalline form when to a boiling solution of thorium nitrate containing 2% of ThO_2 a 40% aqueous solution of arsenic acid (mols.) is added. If less arsenic acid is employed, an amorphous cipitate of variable composition is obtained, whilst if the reaction the quantities mentioned is carried out with dilute solutions the cold, no precipitate may be formed, but, instead, a gelatinous is, which eventually becomes crystalline and then has the above position. *Thorium dihydrogen arsenate*, $Th(H_2AsO_4)_4 \cdot 4H_2O$, is cipitated in colourless crystals when a solution of thorium

nitrate (containing 5% of ThO_2) is treated with a 50% solution arsenic acid (8 mols.). Water converts it into the monohydrate salt.

R. V. S.

Brown Gold. MAURICE HANRIOT (*Compt. rend.*, 1911, p. 138-141. Compare this vol., ii, 118).—A further study of influence of temperature, dimensions, mode of heating, impurity and composition of the original alloy on the contraction undergone when brown gold, the product of the action of nitric acid on silver alloys, is heated. Contraction is not complete below 9° or until after about six hours' heating.

W. O. W.

Mineralogical Chemistry.

Pyrites and Marcasite. VIKTOR PÖSCHL (*Zeitsch. Kryst.*, 1911, **48**, 572-618).—Descriptions are given of the surface characters of crystals of pyrites and marcasite, as seen under a metallographic microscope.

The characters of the faces and the form and orientation of the artificially-produced etched figures suggest that the symmetry of pyrite-tetrahedral-pentagonal-dodecahedral rather than pentagonal-dodecahedral.

Numerous determinations were made of the hardness of natural and artificially-cut faces. The degree of hardness is assumed to be proportional to the volume of material removed (that is, proportional to the square of the width of the scratches produced) by a weight diamond point moved across the surface. The hardness of pyrite relative to that of topaz = 1000, is 199.1 under a load of 50 grams, 182.2 under a load of 20 grams; of marcasite, 134.1 and 140.2 under the same loads respectively. On one and the same crystal no differences in hardness were detected on different faces, or along different directions on the same face. Different crystals, however, differ slightly in hardness, and it is noticed that those which are softer are at the same time less dense. The specifically lightest and heaviest crystals of each lot experimented on were analysed, with the following results, but no essential differences are shown in chemical composition.

	Fe.	Ni.	Co.	Cu.	S.	As.	Total.	Sp. gr.
I.	45.92	0.04	—	0.59	51.70	0.93	99.28	5.098*
II.	45.19	0.07	—	0.93	51.55	0.78	99.22	5.153†
III.	45.32	trace	0.03	0.99	51.78	1.52	99.57	5.078
IV.	45.18	trace	0.09	0.91	51.40	1.73	99.91	5.113
V.	45.67	0.03	0.16	0.26	51.83	1.28	99.63	5.068‡
VI.	45.98	0.02	0.18	0.29	51.95	1.19	99.61	5.101§

* Trace Ag.

† Trace Mn.

I and II, pentagonal-dodecahedral crystals {210} of pyrites found

: III and IV, ditto, from Hüttenberg, Carinthia; V and VI, from Seegraben, near Leoben, Styria. L. J. S.

Composition of Jamesonite and Warrenite. WALDEMAR T. ALLER (*Zeitsch. Kryst. Min.*, 1911, 48, 562—565).—The jamesonite formula proposed by Spencer (Abstr., 1907, ii, 700) is replaced by the pler formula, $4\text{PbS}_x\text{FeS}_y\text{Sb}_2\text{S}_3$, proposed by Loczka (Abstr., 1909, 53), the calculated percentages corresponding with these formulae being:

	S.	Si.	Pb.	Fe.
$4\text{PbS}_x\text{FeS}_y\text{Sb}_2\text{S}_3$	21.70	31.23	41.29	2.78
$4\text{PbS}_x\text{FeS}_y\text{Sb}_2\text{S}_3$	21.86	35.10	40.32	2.72

Warrenite (Eakins, 1888) is shown to be a mixture of the brittle "ather-ore" jamesonite and the flexible "feather-ore" plumbosilicate ($\text{S}_2\text{Sb}_2\text{S}_3$). L. J. S.

Optical Characters of the α - and β -Modifications of Quartz and Leucite. FRITZ RIXE and R. KOLB (*Jahrb. Min.*, 1910, 128—158).—The refractive indices are given for lines of several λ -lengths at various temperatures ranging from -140° to $+765^\circ$. These were determined with prisms enclosed in a specially constructed electric oven or cooling chamber attached to the goniometer. The curves showing the results obtained with quartz exhibit an abrupt peak at 570° , corresponding with the change from α - to β -quartz. The values for α -quartz at 23° are $\omega = 1.5442$, $\epsilon = 1.5533$; for β -quartz at 580° , $\omega = 1.5328$, $\epsilon = 1.5494$ (line D₂). Leucite becomes optically isotropic at 714° , and the plotted curves of the refractive indices indicate in direction near this point, but show no sudden break; the change from α - to β -leucite therefore takes place over a considerable interval of temperature. L. J. S.

Artificial Production of Nesquehonite. GIUSEPPE CESÀRO (*Att. Acad. Roy. Belg.*, 1910, 844—845. Compare *ibid.*, 1910, 749; *ibid.*, 1910, ii, 49, 613).—A solution of sodium hydrogen carbonate and magnesium chloride was exposed outside to the low temperature until the end of November, and the next day there were formed small, transparent crystals of lansfordite ($\text{MgCO}_3 \cdot 5\text{H}_2\text{O}$), together with crystalline globules composed of fine needles having the optical characters of nesquehonite ($\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$). The simultaneous formation of these two substances thus depends on the low temperature and on pressure. L. J. S.

Thaumasite from Beaver County, Utah. B. S. BUTLER and ALLEMAR T. SCHALLER (*Amer. J. Sci.*, 1911, [iv], 31, 131—134).—This mineral has hitherto been found only in Sweden and at Paterson, New Jersey. It has now been found as a filling in small fissures in metamorphosed dolomitic limestone in the Old Hickory copper and magnetite mine in the Rocky Range of Beaver Co., Utah. It is a white mineral with a fibrous structure and silky lustre, and its brittleness (sp. gr. 1.84) is a noticeable feature. Between crossed polars the minute, slender prisms give straight extinction; the

refractive indices are $\omega > 1.500$, $\epsilon > 1.464$. Analysis agrees with usual formula $3\text{CaO}_2\text{SiO}_2\text{SO}_3\text{CO}_2\text{H}_2\text{O}$.

SiO_2	SO_3	CO_2	CaO	H_2O	$(\text{Al}, \text{Fe})_2\text{O}_3$	MgO	Alkalies	P_2O_5	trace
10.14	12.60	6.93	26.81	42.97	0.20	0.23			

L. J.

Are Allophane, Halloysite, and Montmorillonite Silicate Minerals or Mixtures of Colloidal Alumina and Silica? STANISLAUS J. THUCUTT (*Centr. Min.*, 1911, 97—103).—A review of the literature on this question is given (compare Stremme, Abstr.) ii, 1041). The various clay minerals are capable of taking up organic colouring matters (methylene-blue, rhodamine, methyl-orange), but varying nature of the colour reactions suggests that these minerals possess individuality, and are not merely mixtures of colloidal hydrated alumina and silica. When moistened with cobalt nitrate salt and ignited, some of these minerals do not give a blue colour, others become blue only in part. This indicates that the alumina and silica must be chemically combined. The patchy distribution of the colours sometimes obtained indicates that the materials are always homogeneous. L. J.

Deposit of Alunite in the Liparite of Torniella in Province of Grosseto. UGO PANICHI (*Atti R. Accad. Lincol.* [v], 19, ii, 656—664).—Analysis of a typical liparite of the district gave:

SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	K_2O	Na_2O	Total	Loss on heating
72.29	14.10	1.69	0.31	1.34	0.48	4.18	2.97	2.39	99.7

A white deposit which occurs in abundance at Marmoia and Piombino is not kaolin, as has been hitherto believed, but consists of alunite containing a little more silica and iron than the alunite of Torniella. The mineral loses sulphur trioxide when heated, and this loss of weight has been assumed to be due to water by previous investigators. Analysis of a sample of the mineral gave

SiO_2	Al_2O_3	Fe_2O_3	SO_3	H_2O	K_2O	Na_2O	Total
33.92	3.94	0.53	23.26	13.74	9.77	2.34	100.27

The rock at the base of the deposit at Marmoia is impregnated with the substance, which when separated by levigation gave six analytical figures. It is noted that the rocks of the neighbourhood of the deposit of alunite have suffered more change into kaolin than other similar rocks of the same district further removed from it. R. V. I.

Physiological Chemistry.

The Respiratory Exchange as Affected by Body Position. L. E. ENNIS and J. A. RICHE (*Amer. J. Physiol.*, 1911, 27, 406—41).—When the person investigated is sitting quietly in a chair

ilar activity involved causes an increase in metabolism of 8% as used with that in the same person when lying down.

W. D. H.

e Respiratory Exchange of Mice Bearing Transplanted carcinoma. R. A. CHISOLM (*J. Path. Bact.*, 1910, 15, 192—206).—no noticeable difference was found in mice with carcinoma and in mice so far as respiratory exchange is concerned.

W. D. H.

Influence of Preceding Diet on the Respiratory Quotient Active Digestion has Ceased. FRANCIS G. BENEDICT, L. E. S. and J. A. RICHE (*Amer. J. Physiol.*, 1911, 27, 383—405).—respiratory exchange was examined twelve hours after a meal in man subject. The most important fact which came out of the digestion is the rise in the respiratory quotient if the preceding is rich in carbohydrates.

W. D. H.

e Regulation of Breathing by the Blood. HANS WINTER (*Pflüger's Archiv*, 1911, 138, 167—184).—The method adopted of artificial perfusion with Ringer's solution of new-born pals. If the tension of carbon dioxide in the perfusing fluid is apnea is the result; but the addition of more of the gas excites mical breathing. Lack of oxygen during the apneic period does terrupt the apnea, but leads without excitation to death. The ion of acids to the fluid excites respiratory movements, and in certain limits the excitation of the respiratory centres is el to the concentration of hydrogen ions.

W. D. H.

e Influence of Oxygen Breathing. OTTO WARBURG (*Zeitsch. d. Chem.*, 1911, 70, 413—432).—The microscopic appearances corpuscles and echinoderm eggs produced by oxygen, and by which inhibit oxidation, are described and figured. The part played by the cell-membrane and the effect on it of the reagents form main points investigated.

W. D. H.

e Effect of Altitude on the Dissociation Curve of Haemoglobin. JOSEPH BARCROFT (*J. Physiol.*, 1911, 42, 44—63).—The experiments recorded were made on certain members of the recent tuberculosis party which visited Teneriffe. Without going into details of technique and argument, the main practical outcome of the investigation is that some acid substance appears in the blood in increasing quantities as the altitude increases. This change counteracts the change in alveolar carbon dioxide tension to such an extent that the actual dissociation curve under the conditions locally established did not alter.

W. D. H.

Solubility of Gases in Ox-blood and Ox-serum. ALEXANDER LAY and H. JERMAIN M. CREIGHTON (*Bio-Chem. J.*, 1911, 5, 305).—The solubility of oxygen, carbon monoxide, and carbon dioxide in blood and of carbon dioxide in serum is greater than in

water; that of nitrogen and nitrous oxide in blood and serum and oxygen and carbon monoxide in serum is less than in water. When the solubility is increased, the solubility curves fall with increasing pressure; when it is lessened, the curves rise with increasing pressure. The increased absorption of oxygen, carbon monoxide, and carbon dioxide is ascribed mainly to chemical combination. In case diminished solubility, the rise in the curve is ascribed to adsorption.

W. D.

Trimethylamine as a Normal Constituent of Human Blood Urine, and Cerebro-spinal Fluid. CHARLES DOKÉE and F. G. (Bio-Chem. J., 1911, 5, 306-324).—Trimethylamine is a normal constituent of blood and cerebro-spinal fluid. The evidence in urine is not so clear. Filippi's method of estimation was employed with some modifications which considerably shorten it, and good results were obtained. Choline is normally absent in all fluids. In most of the methods at present in use for the detection of choline, trimethylamine would be driven off. The acidity of laboratory alcohol is another possibly source of error. Trimethylamine is most of the reactions (including the periodide reaction) considered to be characteristic of choline. The present observations are compared to normal fluids.

W. D.

Action of Arsenic on the Red Corpuscles. MORIZO OZAWA (Zeitsch. physiol. Chem., 1911, 70, 433-440).—Arsenious acid is found next to hydrocyanic acid to be most powerful in red respiratory changes in red corpuscles. Larger doses destroy the membrane. This substance, in view of the lipid constitution of the membrane, has very small partition-coefficients between oil and water.

W. D.

The Absorption of Haemolytic and Agglutinating Substances. J. DUNIN-BORKOWSKI (Bull. Acad. Sci. Cracow, 1910, 618-617).—The paper consists of a brief account of the results of experiments published in detail in Polish in the *Rozprawy Wydziału Fizyki, Akad. Sci. Cracow* (1910 B).

In the agglutination of red-blood corpuscles by silver nitrate, mercuric nitrate, and ferrous chloride, the relation was determined between the concentration of the salt and the amount taken up by the corpuscles. From the value of the constant n in the equation $A = nC^{\frac{1}{n}}$, where A is the amount absorbed, and C the concentration of the salt, it was found that agglutination was accompanied by an adsorption of the salt in the cases of both silver and mercuric nitrates. With ferrous chloride, however, none of the salt was taken up by the corpuscles. Agglutination may thus take place without adsorption and the theory of Arrhenius, that only those substances which adsorb have any action on the red corpuscles, is not in accord with these results.

The coefficients of partition of the haemolytic agent between the corpuscles and the solution were determined in haemolysis brought about by means of acetic acid, boric acid, and potassium cyanide.

were found to be in contradiction to the hypothesis of Arrhenius
in haemolysis the red corpuscles absorb a quantity of the
sugar sufficient to bring about their complete dissolution.

W. J. Y.

Law Regulating Haemolysis of Erythrocytes in Hypo-Saline Solution or Distilled Water. U. N. BRAHMACHARI (*J. Indian Med. Inst.*, 1911, 5, 291—293).—The amount of haemoglobin dissolved in a given volume of hypotonic sodium chloride solution is proportional to the amount of haemoglobin in the corpuscles tested for solution in the form of a suspension. In the animals tested, the ratio between the above two factors is smallest for the dog and greatest for the rabbit and sheep. It is fairly constant in healthy persons, but varies widely in disease. The same law regulates the diffusion of haemoglobin within red corpuscles which regulates the diffusion of globulin in neutral salt solutions. W. D. H.

Platelets of Human Blood. M. AYXAUD (*Ann. Inst. Pasteur*, 1911, 24, 56—78).—The blood was collected in such a way as to avoid contact with the tissues, and all the vessels used were lined with paraffin to preserve it from the action of the

Under these conditions blood may be kept for some hours (five) without coagulating. The blood was allowed to sediment, leaving colourless plasma containing the platelets drawn off. In fresh plasma the platelets occur as clear, round, plain discs having a rapid rotary movement which causes them to appear as spindle-shaped. On keeping they alter in shape, become granular in structure, and finally disappear. Anti-coagulants vary in their action on the platelets; thus sodium fluoride produces granular changes in them, citrates, oxalates, and metaphosphates preserve the platelets and prevent their agglutination. A number of substances, such as quinine, cocaine, produce changes in the form of the platelets when added to plasma in the presence of oxalates and citrates. Human blood platelets show very little tendency to agglutinate on the addition of stone, gelatin, metallic colloids, or other substances which readily cause agglutination in the platelets of dogs' blood.

Reactions with staining agents show them to have a complex structure and to contain at least two different substances, whilst no differences could be detected by these means between the platelets of human blood and those of other mammals.

A numerical relation could be established between the platelets and the red corpuscles and leucocytes, and they are considered as quite independent of the other elements of blood. W. J. Y.

Effects of Copious Water Drinking with Meals on Intestinal Function. W. M. HARRREM and PHILIP B. HAWK (*Proc. Amer. Physiol. Soc.*, 1910, xxv; *Amer. J. Physiol.*, 27).—The drinking of large quantities (1000 c.c.) or moderate doses (500 c.c.) of water with meals increases the output of urinary indican, but increases that of ethereal sulphates.

W. D. H.

L. C. ii.

Effects of Copious Water Drinking with Meals on Pancreatic Function. PHILIP B. HAWK (*Proc. Amer. physiol.*, 1910, xxvi; *Amer. J. Physiol.*, 27).—The effect is that the pancreatic activity is increased, as judged by the amount of amylase in the faeces.

W. D.

Effects of Copious Water Drinking with Meals on Gastric Secretion. F. WILLS and PHILIP B. HAWK (*Proc. Amer. physiol. Soc.*, 1910, xxxii; *Amer. J. Physiol.*, 27).—The urinary ammonia increased, and this is considered to be an index of a rise in secretion of gastric juice. The acid concentration of the stomach contents is thus maintained, in spite of the large amount of water taken.

W. D.

Comparative Study of Four Digestive Diastases in Certain Species of Coleoptera. L. BOUONNE (*Compt. rend.*, 1912, 228—231).—The digestive enzymes of *Coleoptera* include a proteolytic diastase, an amylase, and an invertase. Experiments have been conducted on a number of different species with the object of determining the relative activity of the different ferments in them and their variation with the natural diet of the insects. The results are tabulated.

It is found that the more carnivorous the species, the greater the proteolytic, and the smaller the lipolytic, activity. Amylase and sucrolytic activity is at a maximum with those insects which favour a mixed diet (*Hydrophilus piceus*), and at a minimum with the carnivorous species, such as *Dysticns marginalis*. Proteolytic enzymes are practically absent from the entirely vegetarian species (*Polyphyllus*). W. D.

The Metabolism of Dogs with Functionally-resected Intestine. FRANK P. UNDERHILL (*Amer. J. Physiol.*, 1911, 366—382).—When 39% of the small intestine is short-circuited, are utilised for many months in a normal way. When 66% is similarly resected, fat utilisation is decreased, and there is a small loss of nitrogen and of body weight, which is specially noticeable some time after the operation. When 75% is resected, food utilisation is severely impaired, and this is particularly the case for fat. Indican elimination is not altered, as in the normal dog, by replacing meat in the diet by gelatin. Ability to utilise carbohydrate is increased; this is of importance in cases of intestinal resection in man. W. D.

The Influence of Meat-extractives on the Absorption of Nutritive Material. The Physiological Value of Meat Extract. WILHELM VOLTZ and AUGUST BAUDREXEL (*Physiol. Archiv.*, 1911, 138, 275—291).—The addition of meat extract to a mixed diet has no effect on the absorption of nitrogenous or non-nitrogenous foods. The nitrogen of the extractives can, under favourable conditions, lead to a retention of nitrogen, or a less rapid loss of nitrogen, which amounts for at least 1% of the excreted nitrogen. The physiological utilisation of the extractives amounts about two-thirds of their potential energy. W. D.

e Utilisation of Yeast in the Human Body. WILHELM Z and AUGUST BAUDREXEL (*Biochem. Zeitsch.*, 1910, 30, 457—472).—ried yeast, from which the bitter principles had been extracted, tolerated in relatively large quantities by man (100 grams in one to two hours). The food-value was determined by feeding men on man in the usual way, and it was found that 86% of protein was resorbed and 88% of the caloric value was utilised. physiological food-value, calculated from nitrogenous equilibrium iments, was 74.8% of its total energy content. S. B. S.

travenous Injection of Pineal Extracts. J. A. E. EYSTER H. E. JORDAN (*Proc. Amer. physiol. Soc.*, 1910, xxiii—xxiv; *Amer. physiol.*, 27).—Aqueous extracts of the sheep's pineal cause a fall terial blood pressure in the dog, which is stated to be greater than that obtained from other parts of the brain. This is associated dilatation of the splanchnic vessels. W. D. H.

e Dichromate Hæmatoxylin Method of Staining Tissues. BRAIN SMITH and W. MATR (*J. Path. Bact.*, 1910, 15, 179—181. are this vol., i, 44).—The substance in the nervous system which ined in the Weigert method is not only cholesterol, but also the rosideride separated by the authors. The relative insolubility of substance in fat solvents accounts for the staining with hæmatoxylin observed in specimens treated with alcohol and ether. It is present in traces in the brain of the new-born infant; hence the difficulty in staining such tissue. The cerebroside has a fluid illine phase extending over a wide range of temperature, and on ure to water it gives "myelin forms." W. D. H.

e Alleged Presence of an Alcoholic Enzyme in Animal es and Organs. ARTHUR HARDEN and HUGH MACLEAN (*J. Physiol.*, 1911, 42, 64—92).—The experiments recorded establish a presumption that alcoholic fermentation cannot be produced by tissues or juices, or powders prepared from them. With the of putrefaction, evolution of gases (carbon dioxide and hydrogen), but not otherwise. W. D. H.

Method of Removing Glycogen from the Human ect. GRAHAM LUSK (*Amer. J. Physiol.*, 1911, 27, 427—437).—ure to cold (baths in ice water) lowers the respiratory quotient sious men to 0.75 to 0.67; this corresponds with Benedict's figure a prolonged fast, and is believed to indicate the disappearance eogen. W. D. H.

e Position Occupied by the Production of Heat in the of Processes Constituting a Muscular Contraction. DAVID V. HILL (*J. Physiol.*, 1911, 42, 1—43).—Muscle is not a engine, for the heat may not appear until the tension has ed to normal. On excitation, some substance (or substances) is ed which affects the colloidal tissues of the muscle and sets up ion proportional to its concentration. The substance is ther

destroyed or replaced in its original position (the presence of α being favourable for both), and the heat then evolved is proportional to the amount of the substance (for instance, lactic acid) in question.

W. D.

Purine Metabolism. V. The Behaviour of the Purines in Muscle during Work. VITTORIO SCAFFIDI (*Biochem. Z.* 1911, 30, 473—480).—The purine-base content in the striated muscle of the frog and toad is smaller than in mammals and fish, and diminishes considerably after work (up to 17%); this diminution is derived from the combined bases, the free bases remaining unchanged in quantity or even increasing. No uric acid was found in the muscle of the frog and toad either in rest or after work. S. I.

The Distribution of the Nitrogen of the Extraneous Substances from Mammalian Muscle. OTTO VOX FÉRÉ & CARL SCHWARZ (*Biochem. Zeitsch.*, 1911, 30, 413—432).—The nitrogen was estimated in the following fractions of the extractives: bases (precipitated by phosphotungstic acid), colloidal substances of albuminous character (precipitated by zinc sulphate by the method), creatine and creatinine (determined by Folin's method), ammonia (determined by distillation with magnesium oxide), substances (determined by Krüger and Schmidt's method), carboxylic acids (determined by Gulewitsch and Krimberg's method), polypeptides (determined by Sörensen-Heuriques' method), amino-acids (determined by Braunstein's method). The materials employed were the muscles of the extremities and of the horse's heart. The constituents were found to be creatine and carnosine. No difference could be detected in the extractives of resting and of muscle in experiments carried out on the muscular tissue of the authors tabulate several series of results. S. I.

Occurrence of Betaine in Cephalopods. MARTIN (*Zeitsch. physiol. Chem.*, 1911, 70, 253—255. Compare Abs. ii, 270).—Octopus muscle, in addition to the taurine previously recorded, contains betaine and two substances yielding soluble picrates, the one m. p. 215—220° (decomp. 225°), and the other decomposing still higher and giving an aurichloride, m. p. 157°, crystallising in slender needles ($\text{Au} = 31.4\%$). E. F.

Isolation of an Hepatic Antithrombin. Description of its Properties. MAURICE DOYON, ALBERT MOREL & A. POLICARD (*Compt. rend.*, 1911, 152, 147—148).—The isolated antithrombin from the dog is perfused with blood from the carotid vein of another dog which has previously received an injection of peptone. Antithrombin is present in the plasma after centrifugation. It is not destroyed by heating the plasma at 100°. If the medium is precipitated by heating the plasma at 100°, but is redissolved in an alkaline solution. W. C.

Demonstration of the Exclusively Hepatic Origin of Antithrombin. Extraction of this Substance by a Solvent for Nuclear Substances. MAURICE DOYON, ALBERT MOREL & A. POLICARD (*Compt. rend.* 1911, 152, 282—283).—The antithrombin

ed in a previous communication (preceding abstract) can be ed from the liver by perfusion with a slightly alkaline, logical salt solution. The active substance contai is nitrogen phosphorus, and may be precipitated from the solvion by the on of acetic acid. It gives a slight biuret reaction.

W. O. W.

α -Aminoethylglyoxaline, a Depressor Constituent of Intestinal Mucosa. GEORGE BARGER and HENRY H. DALE (*J. Physiol.*, 41, 499—503).—Popiel'ski's vaso-dilatin, to which he attributes activities of commercial peptone and various tissue extracts, contains α -aminoethylglyoxaline. It was in the present research identified fully and physiologically in intestinal extracts, and is no doubt substance which in Bayliss and Starling's preparations of secretin lowers blood pressure. The effect of this base in stimulating the as to secrete is very feeble. It also does not affect the coagility of the blood ; this action of vaso-dilatin must be due to other substance in it.

W. D. H.

orce of Immune Substances in Lymph. The Part Played by Spleen in the Formation of Immune Substances. B. LUCKHARDT and FRANK C. BECHT (*Proc. Amer. physiol. Soc.*, xi—xii, xvi—xvii; *Amer. J. Physiol.*, 27).—Haemolysins,mins, and opsonins pass at about the same rate from the blood e lymphs, and make their appearance in the thoracic earlier the cervical lymph. They are also more concentrated in the situation. They hardly pass at all in the cerebro-spinal fluid,ous humor.

formation of such substances is slow and in lessened quantity the spleen is removed. The experiments were made on dogs.

W. D. H.

perimental Hyperthyroidism. ANTON J. CARLSON, J. F. and J. E. McKIE (*Proc. Amer. physiol. Soc.*, 1910, xiii—xiv; *physiol.*, 27).—Different animals exhibit great variations in resistance to thyroid feeding, but the most constant symptom (tachycardia and diarrhea) may be absent even in fatal cases. The and cardiac phases of the symptom-complex in birds and mammals differ from those in man. Feeding on other organs than the thyroid may produce similar symptoms, but they are not the symptoms are due to thyroid feeding.

W. D. H.

cts of Extracts of Different Parts of the Pituitary Gland. J. I. MILLER, D. D. LEWIS, and S. A. MATTHEWS (*Proc. Amer. Soc.*, 1910, xvii—xviii; *Amer. J. Physiol.*, 27).—The experiments show that the pars intermedia is the seat of origin of the pressor effect. The contents of a cyst of this region produced a distinct pressor effect. The substance which slows the heart is confined to the nervosa. Extracts of the stalk of the ox hypophysis never give a pressor effect.

W. D. H.

Neutralisation of Spermotoxins and Alkaloids by the Teat and Epididymis. S. METALNIKOFF (*Archiv.*, 1911, 138, 14—18).—In animals in whose blood

strong spermotoxins are contained, the spermatozoa in the epididymis are normal, for the testis and epididymis contain a substance which neutralises spermotoxins or renders them harmless. This material also neutralises certain alkaloids, such as nicotine, which act harmful on spermatozoa. Curare by itself has but little action on spermatozoa but mixed with epididymis extract it kills them. W. D. H.

The Amount of Alcohol Excreted by the Animal Organism Under Various Conditions. WILHELM VÖLTER and AUGUST B. DREXEL (*Pflüger's Archiv*, 1911, 138, 85—133).—Analytical details given of the quantity of alcohol excreted in the urine, expired air, etc., when it is given under varying conditions of quantity, volume, diluent, habituation, and so forth. W. D. H.

Allantoin-Purine Excretion of the Monkey. ANDREW HUX and MAURICE H. GIVENS (*Proc. Amer. physiol. Soc.*, 1910, xv.; *Amer. J. Physiol.*, 27).—The analyses show the great relative importance of allantoin as an end-product in purine metabolism in monkey. From 500 c.c. of urine from two monkeys, 172 mg. of allantoin, uric acid, and 4.5 mg. of purine bases were obtained. W. D. I.

The Origin of Uric Acid in Man. FRANZ SMETINKA (*Pflüger's Archiv*, 1911, 138, 217—274).—Every protein meal, including those which are purine-free, produces a rise of uric acid excretion which three hours after the meal, may rise to an 80% increase of the pre-meal value. If the meal is taken late in the day, the rise may extend through the night to the following morning. The increase is attributed to metabolic changes accompanying the activity of the digestive glands. If polysaccharides are given, the smaller the digestive glands is accompanied with a smaller rise in uric acid excretion. After taking honey, there is a large rise, which is explained by the intense activity of the liver cells in forming glycogen. The total excretion of nitrogen is but little altered by carbohydrate. W. D. I.

Action of Urinary Antiseptics. ANSON JORDAN (*Bio-Chem.* 1911, 5, 274—290).—Using a defined arbitrary standard, the acidity of normal urine is about 4. With large doses of dihydro sodium phosphate this can be raised to 9, and the urine can easily be made alkaline with potassium citrate. Putrefaction will readily destroy *Staphylococcus* and *Bacillus coli* growth easily, in urines of all degrees of acidity and alkalinity which can be produced in the acidity, however, exciting a restraining influence.

Urotropine acts as a urinary antiseptic by the formation of formaldehyde; in alkaline urine its action is nil, because formaldehyde is then formed. In urine of a little over 4 acidity, the antiseptic power is sufficient to prevent the growth of micro-organisms.

Sandal wood oil is quite feeble against *B. coli* and putrefactive organisms; it has a specific antiseptic action against *Staphylococcus*. The power of salicylic acid is not great, but against *B. coli*

efactive organisms it is more efficient than sandal wood oil, her agent can, however, be compared with urotropine forency.

W. D. H.

hemical Investigation of Atheromatous Aortæ. A. SELIG. **pposition of Deposits in Calcified Aortæ.** M. PH. F. AMESEDER. **arks on the Foregoing Investigations.** RICHARD VON ZLYNEK (*tsch. physiol. Chem.*, 1911, **70**, 451—457, 458—463, 464—465).—natheroma the amount of elastin is lessened, the fat (light petroleum act) is increased, and the calcium in the ash is increased, although total ash may not be.

The second paper gives analytical details.

I. The third paper is explanatory and critical.

W. D. H.

xperimental Glycosuria. VI. The Distribution of Glycogen r the Liver under Various Conditions. Post-mortem cogenolysis. JOHN J. R. MACLEOD and R. G. PEARCE (*Amer. Physiol.*, 1911, **27**, 341—366. Compare Abstr., 1910, ii, 144).—amount of glycogen in different lobes of the liver varies by about This is due to errors of analysis by Pdiger's method, and to an amount of blood and connective tissue in different parts of the

Glycogenolysis is accelerated after death, and this varies in ut lobes; it sets in within twenty minutes after death, and ls at a uniform speed for several hours. The rate is lessened ence of blood, and by cutting up the liver. Nervous influences o part in it.

W. D. H.

c Acid Excretion in Gout and Rheumatoid Arthritis. AM J. MALLORY (*J. Path. Bact.*, 1910, **15**, 207—246).—In gout is a slight fluctuation in the endogenous excretion, a low nuous average, and a small percentage of exogenous purine en excretion excreted as uric acid. In cases associated with sioning these characteristics are more marked. Many cases of however, are atypical. In some cases of rheumatoid arthritis s a somewhat similar disturbance of purine metabolism.

W. D. H.

Wassermann Reaction in Rabbits Infected with the nosomes of Nagana, and the Effect of Treatment with ophenylglycine (Ehrlich). CARL H. BROWNING and IVY NZIE (*J. Path. Bact.*, 1910, **15**, 182—191).—A full account of nents previously published (this vol., ii, 59). W. D. H.

Influence of Quinine and Quinine Derivatives on mental Trypanosome Infection. JULIUS MORGENTHROTH and BERSTAEDTER (*Sitzungsber. K. Akad. Wiss. Berlin*, 1911, 30—37). continuation of previous investigations (Abstr., 1910, ii, 881), the s now show that hydroquinine, which is not more toxic than e, has a greater trypanocidal action. The method of adding the o cakes of food-stuff was employed as in former work, and una trypanosome was the source of infection. S. B. S.

Ingestion of Mineral Acids by the Dog. HENRI LABE L. VIOILLE (*Compt. rend.*, 1911, 152, 279—281).—When dogs in a state of nitrogenous equilibrium are dosed with hydrochloric acid in quantity insufficient to affect their general health, an increased urinary excretion of volatile bases takes place, proportional to the amount of acid administered. The ratio between the acid and bases is practically molecular. The same thing is observed when diet is insufficiently nitrogenous. The experiments are held to support the view that the organism protects itself against acid intoxication by the increased formation of ammonia. W. D.

Migration of Solutions in Bodies Deprived of the Capillary Circulation. SAMUEL J. MELTZER (*Proc. Amer. physiol.*, 1910, xxix—xxx; *Amer. J. Physiol.*, 27).—The injection of adrenalin and strychnine into the dorsal lymph sac of the frog produces time effects on the pupil and spinal cord respectively, even though the circulation has been stopped by removal of the heart. Migration of these substances can therefore take place again through the lymph spaces. W. D.

A Second Active Ergot Base. R. ENGELAND and FRIEDRICH KUTSCHER (*Chem. Zentr.*, 1910, ii, 1394—1395; from *Zentr. Ph.*, 1910, 24, 479—480).—The authors have previously obtained an ergot base from ergot containing a glyoxaline radicle (*Abstr.*, 1910, ii). Another base is now described which has active physiological properties and is identified with the guanido-butylaminoguanidine of Kossel from the properties of the carbonate and sulphate and from the analysis of the anilochloride and picrate. It is precipitated by silver nitrate and baryta after removal of the bases precipitated by ammonium silver nitrate. The silver compounds are then converted into picrolonates, and these into the carbonate and sulphate. Contractions were produced in a cat's uterus suspended in 70% Ringer's solution by 0.001 gram of the dichloride in alkaline solution, and the contraction was only slightly increased by the addition of an equal quantity of β -aminoethylglyoxaline.

Injections of the dichloride into rabbits temporarily increased blood pressure and respiration. W. D.

[**Physiological Action of**] **Pilocarpine.** I. N. WATSON (*Zeitsch. physiol. Chem.*, 1911, 70, 441—450).—Pilocarpine, in addition to its known actions on sympathetic nerves, causes in rabbits an increase in urine, the appearance of sugar in that secretion, and of susceptibility to adrenaline. W. D.

[**Physiological] Action of Some isoQuinoline Derivatives.** PATRICK P. LAIDLAW (*Bio-Chem. J.*, 1911, 5, 243—273).—A review of the action of a number of isoquinoline bases is made, and their action compared with their chemical constitution. A law of relative action for one series is put forward. 6:7-Dimethoxy-2-methyl-3:4-dihydroisoquinolinium chloride (Pyman, *Trans.*, 1909, 95, 1271) has an action very similar to that of hydrastinine. The generally accepted

of the action of hydrastinine on the functions of the body is
d to be erroneous in several points.

W. D. H.

Antagonistic Action of Salts. JACQUES LOEB (*Proc. Amer. physiol.*, 1910, xxxii—xxxiii; *Amer. J. Physiol.*, 27).—Pure potassium
ide of the same concentration as in sea-water kills *Fundulus* in
lays or less, while in sodium chloride of the same concentration
ish live indefinitely. The toxicity of the potassium salts can be
ised by sodium chloride added in a certain constant ratio. The
ion is drawn that a partition of some colloidal anion between
two metals occurs in the gills.
ere is an upper limit for the concentration of potassium chloride,
d which its toxic action can be no longer inhibited by sodium
ide.

W. D. H.

Case of Poisoning by Sewer-gas. WILHELM GÖHLICH (*Chem.*, 1911, 35, 129—130).—The investigation arose out of a case of
en illness, ending in death, in a workman engaged in cleaning a
r. Samples of the sewer-water were found to contain arsenic and
sulphuric acid in such quantities that the addition of zinc or iron
need an evolution of arsenic trihydride, which could readily be
ted with silver nitrate paper. The illness was attributed to
ming by arseeoic trihydride, formed by the action of the sewer-
r on the iron tools and zinc bucket, which the man was using at
ime. Post-mortem examination revealed the presence of arsenic
he organs and blood. The sulphuric acid and arsenic were
tually traced to the drainage from an artificial manure
factory.

W. J. Y.

hemistry of Vegetable Physiology and Agriculture.

n Automatic Pipette. CARL PERMIN (*Centr. Bakter. Par.*, 1911,
7, 575—576).—The pipette is designed for bacteriological and
ogical work, and consists of an ordinary graduated pipette
ected by a side opening with an india-rubber ball, which is
ted on the stem just below the top. The ball serves to fill the
te, the opening at the top of the stem being closed with the
r. The liquid is run out by removing the finger from the top of
pipette in the usual manner.

W. J. Y.

**cation of the Bulgarian Ferment on Monobasic Acids
ved from Reducing Sugars.** GABRIEL BERTRAND and R.
DON (*Compt. rend.*, 1911, 152, 330—332).—The Bulgarian
ent has no action on solutions of calcium gluconate, galactonate,
nate, maltobionate, or lactobionate. The first four salts have
fluence on the lactic fermentation of dextrose or lactose. In the
of solutions containing lactose and calcium lactobionate, however,

the ferment produces more lactic acid than corresponds with weight of sugar present. This may be explained by supposing that an endolactase is only liberated in media containing lactose; under these conditions the lactobionic acid becomes hydrolysed, the result galactose then forming lactic acid. W. O. W.

Fungicidal Properties of Liver of Sulphur. FREDERICK FOREMAN (*J. Agric. Sci.*, 1911, 3, 400—416).—Liver of sulphur contains various oxidation products, and usually free sulphur, in addition potassium or sodium hydrosulphide, sulphide, and polysulphide. Experiments with spores of *Botrytis cinerea* showed that the oxidation products have little or no fungicidal properties in weak solution and that saturated hydrogen sulphide solution and free sulphur have no effect. The chief agent in the mixture is the sodium hydrosulphide. Potassium hydroxide is less poisonous.

Methods for the analysis of liver of sulphur are described.

N. H. J. J.

Influence of Manganese on the Development of *Aspergillus niger*. GABRIEL BERTRAND and MAURICE JAVILLIER (*Compt. Rend.*, 1911, 152, 225—228. Compare Abstr., 1908, ii, 124).—*Aspergillus niger* was cultivated in a manganese-free nutrient solution, to which definite quantities of pure manganese sulphate were added. Special precautions were taken to avoid the presence of metals, such as copper and iron, which favour the growth of the organism. It was found that manganese had a favourable influence on the development of mould, the yield increasing with the proportion of metal added, in dilutions of 1:1,000,000 to 1/100. At higher concentrations manganese exerted a prejudicial action. W. O. V.

Calcium Requirements of Plants. Different Relation between the Calcium and Magnesium in Nutritive Solutions. I. KONOWALOFF (*Landw. Versuchs-Stat.*, 1911, 74, 343—360).—Results of water-culture and sand-culture experiments with varying amounts of calcium showed that the yields increase up to a certain point and then decrease in the amount of calcium. In most cases the highest yield was obtained with solutions containing 0·2% CaO.

With varying relations of calcium (as nitrate) and magnesium the highest yield was obtained with the ratio CaO:MgO = 1:1. When, however, the calcium was in the form of sulphate or carbonate, the results were equally good, or better, results were obtained with the ratio 6:7.

Comparing different calcium compounds (with a ratio CaO:MgO = 6:7), it was found that tricalcium phosphate gave the best results. Calcium carbonate (marble) had no injurious effect when the ratio was 53:6. N. H. J.

Basic Components of Bamboo Shoots. GINZABURO TANAKA (*Zeitsch. physiol. Chem.*, 1911, 70, 388—390).—Fresh bamboo shoots are shown to contain betaine and choline, in addition to tyrosine, asparagine, guanine, xanthine, hypoxanthine and adenine. E. F.

Taxes of the Coniferae. J. BOUGAULT (*J. Pharm. Chim.*, 1911, 3, 101—103).—In addition to juniperic and sabinic acids, already isolated from the wax of *Juniperus sabina*, a small quantity of thapsic acid, which has been shown to be an oxidation product of juniperic acid, has been obtained (compare *Abstr.*, 1909, i, 82; 1910, 57). Sabinic acid has also now been obtained from the wax of *Thuja occidentalis*. This wax may also contain a trace of thapsic acid.

T. A. H.

The Chromogenic Substances of White Grapes. SERAFINO ANI (*Chem. Zentr.*, 1910, ii, 1141—1142; from *Staz. sperim. r. ital.*, 1910, 43, 428—438).—Two chromogenic substances were found in white grapes, of which one only is precipitated by lead acetate. By the action of hydrochloric acid, colouring matters are released, which are analogous to the "oenocyanins." The conversion of these substances into colouring matters is due not to oxidation, but rather to hydrolytic scission with simultaneous formation of a new substance. In the residue from the chromogenic substances are other substances which give a red coloration with alkalies.

N. C.

The Tonic Effect of Certain Organic Substances in Solution as Vapours. HERMANN STADLER (*Arch. Hygiene*, 1911, 73, 217).—The toxicity of the aliphatic alcohols increases as the molecular weight increases; on the other hand, the toxicity of the aliphatic aldehydes falls off with increasing molecular weight. The replacement of oxygen by sulphur in aliphatic compounds leads to a marked increase in toxicity. The effect depends only on the nature of the substance present, and not at all on the form in which it occurs; the compounds examined were equally toxic whether they were used as solutions or as vapours, provided only the partial pressure was the same; indeed, knowing the toxicity of a substance in liquid form, its toxicity in vapour form is readily calculated according to Henry's law. But this rule breaks down when the substance comes into contact with the nutrient medium on which the organisms are growing; in this case vapours act more powerfully than solutions of the same concentration at the same partial pressure.

A table is given showing the concentrations at which a number of alcohols, aldehydes, and other substances totally inhibit the growth of *Lachnospirillum pyogenes aureus*, *Bact. pyocyanum*, and *B. coli var.* On the latter organism experiments were made both with ions and vapours.

E. J. R.

Inhibition on Green Plants of Some Substances Extracted from Coal-tar and Employed in Agriculture. MARCEL MIRANDE (*Anal. rend.*, 1911, 152, 204—206. Compare *Abstr.*, 1909, ii, 824; 1910, ii, 884; this vol., ii, 64).—Insecticides prepared from coal-tar liable to bring about anaesthesia or blackening of the leaves of plants. Direct contact with the liquids is more injurious to the plants

than exposure to the vapours. The action on the chlorophyll appears to be due principally to the phenols present in such preparations.

W. O. W.

Influence of Different Amounts of Water, Different Manures, and Consolidation of the Soil on the Development of Wheat and Barley in the First Period of Growth. R. FOLLE (*J. Landw.*, 1910, 58, 297—344; from *Ind. Diss. Göttingen*).—Vegetation experiments are described in which wheat and barley were grown in boxes containing loam and sand soil respectively, both without and with manure, and with low higher percentages of water. In some the soil was consolidated by pressure, whilst in others it was employed in a looser condition.

Full particulars as to length and weight of the main roots and roots produced under the different conditions are given, as well as amounts of growth above ground.

N. H. J. Y.

Amounts of Ammonia and Nitric Acid in Rain-water at Tonquin. M. AUFRAY (*Bull. Économ., Hanoi-Haiphong*, 1909, 595—616). Compare Leather, Abstr., 1906, ii, 487; Brünnich, i, ii, 647).—The amounts of nitrogen as ammonia and as nitrates estimated in 123 samples of rain-water collected in the Botanical Gardens, Hanoi, from April, 1902, to March, 1905, and in 313 samples collected from June, 1906, to September, 1909, in an open space in the middle of the same town. Assuming the composition of the rain to approximately represent the whole rainfall, the average amount of nitrogen per million, and the total amounts per acre, for the six years would be as follows :

	Rainfall, inches.	N per million		N per acre (lbs.)	
		as ammonia.	as nitrates.	as ammonia.	as nitrates.
1902-3	90·55	0·71	0·66	14·71	13·47
1903-4	59·68	0·69	0·80	13·31	10·89
1904-5	84·72	0·64	0·43	12·25	8·26
1905-6	49·92	0·54	0·36	6·13	4·06
1907-8	57·31	0·33	0·27	4·39	3·54
1908-9	77·72	0·23	0·15	4·04	2·65

Of the total rainfall, about 82% falls from May to October. This contains about 84% of the total nitrogen.

N. H. J. Y.

Analytical Chemistry.

Recent Advances in Forensic Chemistry. MAX DEXX (*Ber.*, 1911, 41, 5—38).—A lecture delivered before the German Chemical Society.

olumetric Analysis with Small Quantities of Liquid. ILCH (*Monatsh.*, 1911, **32**, 21—29).—A special form of apparatus described, which consists essentially of two burettes opening into a reaction chamber of 20 c.c. capacity. Each burette is 40 cm. long, and has a capacity of 3 c.c.; each cubic centimetre is divided into 100 parts, and the accuracy of measurement is 1—0·002 c.c.

Nernst micro-balance is used for weighing out the substances (—2 mg.) to be introduced into the reaction chamber. Experiments are given showing that accurate results may be obtained in iodometry, volumetric determinations with silver nitrate, titrimetry, alkalimetry, and in the estimation of nitrogen by the Edahl process. In the last process the ammonia is distilled directly from the acid contained in the reaction chamber. T. S. P.

Micro-filter for the Treatment of Small Quantities of Precipitate. JULIUS DONAU (*Monatsh.*, 1911, **32**, 31—41).—The apparatus, from thin platinum foil and asbestos fibre, of a modified crucible is given. The crucible weighs only 0·02 gram, and can be used with the filtering tube previously described (Abstr., 1910, **12**).

Accurate results have been obtained in the gravimetric determination of antimony, arsenic, tin, iron, potassium, silver, and copper, the weight of substance taken varying from 1—3 mg. T. S. P.

Simple Flask and an Arrangement for Carrying Out Chemical Reactions. EUGEN SPITALSKY (*Chem. Zeit.*, 1911, **35**, 1).—The apparatus is intended to prevent any loss caused by spilling the reaction is somewhat violent. A flat-bottomed flask having a narrow opening into a bulb-shaped neck serves as reaction flask, the very small amount of liquid which is carried off by the gases being retained by means of a glass ball, or, preferably, a round porcelain sieve placed over the constriction. When the liquid is heated to boiling, any liquid condensed in the neck runs back into the flask, rinses the porcelain sieve, thus absolutely preventing loss of substance.

The apparatus can also be used for carrying out reactions which take a long time to finish, such as the iodometric estimation of chromic acid, the determination of the iodine number of fats. By carefully adding a little water or chloroform on to the porcelain sieve, or a glass ball, a seal is formed, which prevents any volatilisation of the reagent. L. DE K.

Yellow Colour of Alcoholic Potash. R. GAZE (*Chem. Zeit.*, 1910, ii, 1499—1500; from *Apoth. Zeit.*, 1910, **25**, 668—669).—The best method for the preparation of colourless alcoholic potash consists in placing a cooled solution of 66 grams of potassium hydroxide (purified by alcohol) in 66 grams of water in a litre flask, with constant shaking, slowly adding absolute alcohol to the mark. The solution when prepared should be kept in a white glass vessel in the light. To decolorise yellow or brown alcoholic potash, it should

be left in contact with fresh animal charcoal for twelve hours, & frequently shaken.

N.

Method for Complete Destruction of Organic Matter in Detection of Mineral Poisons. PIERRE BRETEAU (*Compt. r* 1911, 152, 199—200).—Three hundred grams of the material are warmed with 300 c.c. of pure sulphuric acid (D 1·84) in a 2-litre flask, and the mixture treated with a current of oxides of nitre which are best prepared by passing sulphur dioxide into 500 c.c. nitric acid contained in Durand wash-bottle. The gas is freed by spray by passage through cotton wool. The temperature is gradually raised, and the process completed as in the Kjeldahl estimation of nitrogen. If necessary, 50 c.c. of sulphuric acid are added to compensate for loss by evaporation. When the liquid has become colourless, it is concentrated in a platinum dish and treated in usual way. The process is complete in about four hours; the above mentioned quantity of nitric acid is sufficient for four or five operations.

W. O. V.

Simple Method of Applying Boedeker's Reaction. J FERRER HERNÁNDEZ (*Anal. Fis. Quim.*, 1911, 9, 16—17).—Papers are prepared by soaking in 6% zinc sulphate and then in sodium nitroprusside. They keep well in the dark, and are sufficiently sensitive. One part of sodium sulphite in 2500 can be detected.

G. D.

The Kjeldahl Nitrogen Process. WILLEM VAN RYN (*Ph. Weekblad*, 1911, 48, 27—28).—If it should be necessary to temporarily stop the heating with sulphuric acid, the Kjeldahl flask may be stopped with a perforated rubber cork, through which passes a tube bent at right angles and furnished near its lower end with a glass bulb. The end of the tube is made to dip into a small quantity of sulphuric acid. As the flask cools, the acid is drawn up into the bulb, and the air which follows has to bubble through the acid, and is thus freed from ammonia vapour and any ammonia.

L. DE

The Estimation of Small Quantities of Ammonia. J ARTMANN (*Chem. Zeit.*, 1911, 35, 50—51, 64—65).—For quantities not exceeding 2 mg. of ammonia per litre, the colorimetric (Nessler) process is the best. For larger quantities, the iodometric method (addition of sodium hypobromite, estimating the excess iodometrically) is more suitable. In some cases a preliminary distillation of magnesia is resorted to.

In the presence of nitrates these are rendered harmless by means of potassium permanganate and a little dilute sulphuric acid. The permanganate is reduced by means of ferrous sulphate, any excess of which is oxidised by cautious addition of permanganate. To remove the iron and manganese, the liquid is made alkaline with sodium hydroxide and shaken with a little barium carbonate. After making up to a definite volume with ammonia-free water, the solution is allowed to settle, and an aliquot part is then poured off and titrated with hypobromite.

L. DE

Estimation of Nitrates in Vegetable Matter. KARL KROG and in SEBELIEN (*Chem. Zeit.*, 1911, 35, 145—146).—In order to be able apply successfully the recent “nitron” process to the estimation of nitrates in such vegetable substances as turnips for instance, it is necessary to remove some of the interfering organic matters. A liquid for treatment with the “nitron” reagent may be obtained by heating 10 grams of the material with a mixture of 300 c.c. of alcohol and 200 c.c. of water; 250 c.c. of the extract are then evaporated to about 80 c.c. to expel the alcohol, the liquid is treated with a little purified animal charcoal, and the filtrate and washings concentrated to 25 c.c. After adding the reagent and cooling in water for two hours, the separation of the “nitron” nitrate will be complete.

L. DE K.

Estimation of Phosphoric Acid in Superphosphates and Bone-Meals. ZYGMUNT ROMANSKI (*Chem. Zeit.*, 1911, 35, 163—164). Fifty c.c. of the prepared solution (= 1 gram of superphosphate or 1 gram of raw phosphate) are mixed with 50 c.c. of magnesium solution, and 30 c.c. of 10% ammonia are added. (When dealing with phosphates a sufficiency of 20% ammonia is used to neutralise the acidity.) After remaining for an hour with frequent stirring, another 10 c.c. of 10% ammonia are added, and the whole is left overnight. Precipitate is now collected in a Neubauer crucible, washed first with ammoniacal water, then with alcohol, and finally with light oleum (D 0·64). It is then dried in a vacuum and weighed, or it may be dried in an oven at a temperature not exceeding 40°. The weight multiplied by 28 or 56 respectively = % of phosphoric acid in the sample.

The acid magnesium solution is prepared as follows: 300 grams of magnesium chloride and 400 grams of ammonium chloride are dissolved in 7 litres of water. One litre of 20% ammonia is added, and 1000 grams of citric acid.

L. DE K.

The Estimation of Silver by Electro-Deposition from an Ammoniacal Solution of the Oxalate. FRANK A. GOOCH and FEISER (*Amer. J. Sci.*, 1911, [iv], 31, 109—111).—Twenty-five c.c. of the silver nitrate solution (containing about 0·25—0·50 gms. of silver) are precipitated with ammonium oxalate, and the silver is redissolved by adding ammonia. From this solution, after dilution to 100 c.c., the metal is deposited electrolytically, using a current of 0·25—1·5 ampere and 4—7 volts. The cathode with the deposited silver is dried over a low flame, and then heated to incipient fusion. The operation takes from twenty-five to thirty minutes. The best form of apparatus appears to be a ganzé cone set point downwards, and so placed with relation to an annular platinum band used as anode that the end of the axis where the centrifugal effect of rotation is least shall not receive much of the deposit. The silver nitrate may be also precipitated by hydrochloric acid, the silver chloride is then dissolved in ammonia, and electrolysed in the presence of ammonium oxalate.

L. DE K.

The Wartha-Pfeiffer Method of Estimating the Hardness of Natural Waters. J. M. SILBER (*Arch. Hygiene*, 1911, 171—182).—The ordinary soap method fails to give accurate results in presence of magnesium salts or of dissolved carbon dioxide. Wartha's method, as modified by Pfeiffer, works satisfactorily (compare Pfeiffer, *Zeitsch. angew. Chem.*, 1902, 9, 128). Complications arise when the saline matter consists chiefly of the sulphates and chlorides of calcium and magnesium, but these are obviated by some modifications in procedure suggested by the author; for details, which the original paper must be consulted. It is claimed that with these modifications the method is easy, rapid, and accurate.

E. J. R.

Physico-chemical Estimation of Calcium in Wine. MARIE DUBROUX (*Chem. Zentr.*, 1910, ii, 1566—1567; from *Schweiz. Chem. Pharm.*, 1910, 48, 592—594).—Calcium cannot be estimated directly in wine by measuring the conductivity of the latter, owing to the presence of substances which interfere with the estimation. It is necessary to separate the calcium from the other electrolytes by using 50 c.c. of the wine with 2 c.c. of dilute sulphuric acid and 100 c.c. 35% alcohol; after the lapse of two hours, the precipitated calcium sulphate is collected on a filter, washed with 70% alcohol, and dissolved in about 30 c.c. of water. The solution is now titrated with a 1/10-potassium oxalate solution, which is added drop by drop, and conductivity is determined after the addition of each drop. The precipitation curve of the calcium oxalate consists of two straight lines connected by a short curve; the intersecting point of the two straight lines, when these are extended, corresponds with complete precipitation of the calcium oxalate. It is recommended that 1·5 minutes should be allowed to elapse after the addition of a drop of potassium oxalate solution before the conductivity is measured.

W. P.

Quantitative Separation of Barium, Strontium, and Calcium. J. L. M. VAN DER HORST VAN DEN BOS (*Chem. Weekblad*, 1910, 5—10).—In estimating barium, strontium, and calcium in a mixture of their salts, the barium is precipitated from the boiling solution by addition of a few drops of glacial acetic acid and a slight excess of ammonium chromate solution, the clear liquid decanted through a Gooch crucible, the precipitate washed by decantation several times with a dilute solution of acetic acid and ammonium chromate, transferred to the crucible, and washed with warm water until the residue does not react with silver nitrate. The crucible is heated to redness.

To estimate the strontium, the filtrate from the barium chloride is concentrated to remove excess of acetic acid, diluted with a small quantity of water and made neutral or slightly alkaline with ammonia, treated with ammonium chromate, and evaporated nearly to dryness. After cooling, the residue is triturated with 50% alcohol, and the alcohol decanted through a Gooch crucible, the process being repeated until the alcohol is almost colourless. The precipitate is then transferred to the crucible, and washed with 96% alcohol. It is then dried in an air-oven at 80—90°, and weighed.

The author suggests estimating the calcium in the filtrate from the strontium chromate by precipitation as calcium oxalate, and titration with permanganate, but has not tried the method. The washing of the strontium chromate with alcohol is a slow process, and the percentage of strontium present in the mixture must be low.

A volumetric method of estimating the three metals is recommended. The solution employed contained 0.157 gram barium, 0.1317 gram strontium, and 0.1071 gram calcium. To estimate the barium, it is heated to about 300 c.c., boiled, acidified with acetic acid, and treated with 50 c.c. of 0.2088*N*-potassium dichromate solution with constant stirring, the dichromate solution containing sufficient ammonia to give a yellow colour. After cooling, the liquid is diluted to 500 c.c., barium chromate allowed to settle, and 100 c.c. of the clear liquid filtered through a filter. To the filtrate is added a solution of sodium iodide in hydrochloric acid, and the liberated iodine is titrated with thiosulphate.

To estimate the strontium, 350 c.c. of the solution are evaporated to 10 c.c. of 0.2088*N*-potassium dichromate solution, coloured yellow with ammonia, and, when almost dry, triturated with 50% alcohol. It is then diluted with 50% alcohol to 250 c.c., allowed to stand for half an hour with occasional shaking to facilitate separation of the potassium dichromate, 100 c.c. decanted through a filter, and treated with a solution of potassium iodide in hydrochloric acid. After two or three minutes, the solution is diluted with water, and titrated with thiosulphate.

For the estimation of the calcium, 125 c.c. of the filtrate from the strontium chromate are diluted, boiled, made slightly alkaline with ammonia, and precipitated with ammonium oxalate. The precipitate is allowed to settle, and washed by decantation with warm dilute ammonium oxalate to remove the chromate. After washing out the excess of ammonium oxalate with warm water the residual calcium is titrated with potassium permanganate.

The fact that oxalic acid is readily oxidised by warm acid solutions sometimes precludes estimating the calcium by titration of the excess of ammonium oxalate added.

A. J. W.

Haldemar Fisher's Modification of Volhard's Method for Volumetric Estimation of Manganese, and its Comparison with other Well-known Methods. EDWARD CAHREN and HARRY LITTLE (*Analyst*, 1911, 36, 52-59)—Fisher's method is the best of all the modifications of Volhard's method from time to time suggested. The authors' method, which is practically the same as that of Fisher, is as follows: The neutral solution of manganese salt containing 10 grams of zinc sulphate is diluted to 500 c.c. and heated to 80°. One gram of pure zinc oxide is added, and the liquid is boiled with permanganate until slightly pink. The liquid is then cooled somewhat, and 1 or 2 c.c. of glacial acetic acid are added. The colour of the colourless solution is then continued until the pink colour is permanent.

L. DE K.

Assay of Bog Ores. AUGUST KAYSER (*Chem. Zeit.*, 1911, 35, 102).—Some practical hints as to the assay of these ores are given.

The analysis should be performed on the sample dried for five hours at 100°, and it must be remembered that the powder is very hygroscopic. The organic substances may be destroyed either by ignition or more conveniently by treating the hydrochloric acid solution with potassium permanganate. The iron is then titrated by Reinhart (stannous chloride) method.

It is recommended that the analysis should be done in duplicate, that is, both by the ignition and the permanganate process.

L DE 1

Deposition of Metallic Chromium in the Electrolytic Estimation of Manganese by Engel's Method. J. KÖSTER (*Z. Elektrochem.*, 1911, 17, 57-58).—The deposit of metallic manganese formed on the cathode according to Otin (*Abstr.*, 1909, ii, 703) is shown to consist mainly of chromium. It is only formed when the electrolysis is carried out with too large a current density. T.

Analysis of Molybdenum Ganz. WALDEMAR TRAUTWEIN (*Zeitsch. angew. Chem.*, 1911, 24, 207).—The process described previously (*Abstr.*, 1909, ii, 942) requires a slight modification when dealing with ores containing zinc blonde.

The solution of the molybdenum in ammonium polysulphide should be heated to boiling so as to render the zinc sulphide filterable. The filtrate is then acidified to precipitate the molybdenum trioxide. After converting this into the trioxide, and weighing, it should be tested for impurities to be deducted from the total weight. The oxide is fused with potassium hydrogen sulphate, the mass dissolved in hot water, and precipitated by ammonium carbonat. The precipitate, consisting of alumina and silica, is washed with ammoniacal water containing a little ammonium nitrate, ignited, and weighed. L DE 1

Estimation of Tungsten. B. MIDIVANT (*Bull. Soc. chim.*, 1911, [iv], 9, 122-124; *Bull. Soc. chim. Belg.*, 1911, 25, 41-42).—The solution should contain the tungsten as ammonium tungstate, or as potassium or sodium salt. Fifty c.c. of the solution, representing about 0.1 gram of tungsten trioxide, are mixed with 20 c.c. of a recently-prepared tin solution containing 50 grams of crystallized stannous chloride per 200 c.c. of strong hydrochloric acid. After boiling for two minutes, the blue precipitate is washed with hot water, boiled for two minutes, the blue precipitate is washed with hot water, collected, ignited, and weighed as triox (first by decantation). Experiments have shown it to be absolutely free from tin. The presence of ferric chloride does not interfere with the reaction. L DE 1

A Reaction for Uranium Salts. J. A. SIEMSEN (*Chem. Ber.*, 1911, 35, 159).—Any salt of uranium when mixed with a solution of ethylenediamine at once yields a bright yellow, crystalline salt, soluble in excess of the reagent. The reaction is almost as delicate as the ferrocyanide or hydrogen peroxide test. L DE 1

The Separation of Titanium from the Heavy Metals. KARL WEMANN and H. SCHIRMEISTER (*Metallurgie*, 1910, 7, 723—729. *Bare Abstr.*, 1910, ii, 1073).—Titanium is readily separated from iron or nickel by precipitation as orthotitanic acid by means of ionia. Organic acids hinder the precipitation of titanium, and therefore cannot be used for its separation from iron, but the conversion of the iron into ferrocyanide is found to answer the purpose, iron being previously reduced to the ferrous state.

From 0·3 to 0·5 gram of the substance is dissolved, and the solution, which must not be too acid, is diluted to 500—600 c.c. and warmed to 40° with 20—30 c.c. of a saturated solution of sodium hydrogen citrate until free from ferric iron. After warming to 40°, 100 c.c. of a solution of potassium cyanido in concentrated ammonia are added, with stirring, and the solution is boiled until the precipitate is pure white and the solution pale green. The iron is filtered out of contact with air, and the precipitate is washed with an ammoniacal solution of ammonium sulphite and then with hot water. The iron in the filtrate may be estimated, after evaporation to dryness with sulphuric acid, by dissolving in water, precipitating with ammonia, and dissolving and titrating the precipitate.

Titanium may be titrated with permanganate after reduction with zinc chloride if the quantity of titanium present is less than one-tenth of the iron, mercuric chloride and a solution of manganous acetate and phosphoric acid being added. When the proportion of titanium is larger, the greater part of the excess may be removed by precipitating the iron by Classen's hydrogen peroxide method. Titanium and iron may be titrated together after reduction with zinc, when titanium is then obtained by difference.

C. II. D.

Qualitative Reactions of Oil of Turpentine, Pine Wood Oil, Resin Spirit. CARLO GRIMALDI (*Chem. Zeit.*, 1911, 35, 52).—Adulteration of oil of turpentine with pine wood oil or with resin may be detected by shaking 4 c.c. of the sample with 200 c.c. of a solution of 27·5 grams of mercuric acetate in a litre of water for half an hour; 160 c.c. of diluted nitric acid (3 parts of nitric acid, 1 part of water) are then added, and the whole is again thoroughly shaken. Pure oil of turpentine gives a clear solution, but when treated with either of the above substitutes to a considerable extent a turbid liquid is obtained, gradually yielding a flocculent precipitate. In doubtful cases a larger quantity of the sample may be used.

L. DE K.

Exact Estimation of Caoutchouc in Vulcanised Rubber Materials. GERHARD HÜBENER (*Chem. Zeit.*, 1911, 35, 113—115).—Bitumen or bituminous substances interfere with the estimation of caoutchouc in vulcanised rubber by the tetrabromide method, as they form insoluble bromides and cause the results for the caoutchouc to be too high. The bitumen bromide may, however, be removed by treating the mixed bromides with a mixture consisting of equal parts of absolute alcohol and carbon tetrachloride; the caoutchouc

bromide is insoluble in this solvent. Paraffins and resins also are insoluble bromine compounds, and it is probable that these would be removed by the alcohol-carbon tetrachloride mixture; in any case paraffins and resins, if present in the rubber material, can be eliminated by extraction with acetone previous to the bromination.

W. P.

Estimation of Sucrose in Beet Sugar Factory Refuse Clerget's Process, Using Invertase as Hydrolyst. JAMES OGILVIE (*J. Soc. Chem. Ind.*, 1911, 30, 62—64).—Distinctly better results are obtained in estimating sucrose in beet molasses by Clerget's process, using invertase as a hydrolyst, than are found by the ordinary Herzfeld modification, in which concentrated hydrochloric acid is employed as the hydrolyst. But if, in the Herzfeld process, the error due to the influence of the optically active non-sugar substances is obviated, by using the direct acid polarisation, instead of the alkaline (basic lead acetate) polarisation, the results do not differ appreciably from those obtained by means of invertase. From this it would appear that invertase is a selective hydrolyst, inverting only sucrose (and rafinose, if present), without affecting the non-sugars. Pellet's method of obviating the error due to the influence of optically active non-sugar substances, by taking the direct polarisation in a solution acidified with sulphurous acid, gives the same results as the method proposed by Andrlik and Staněk, in which concentrated hydrochloric acid and urea are used. As a practical method, the sulphurous acid process is now recommended as preferable to the Andrlik and Staněk procedure, by reason of its simplicity and other apparent advantages.

W. P.

Estimation of Formic Acid in Foods. HEINRICH FRÖHLICH (*Zeitsc. Nahr. Genussm.*, 1911, 21, 1—15).—The author has submitted the process described by Auerbach and Plüddemann (April 1909, ii, 355) to a critical examination, and finds that it yields trustworthy results. When only a few estimations of formic acid have to be made, it is more convenient to collect the precipitated mercuric chloride on a filter and weigh it, as in this case there is no need to prepare the standard solutions required if the estimation is carried out volumetrically. In separating formic acids from food material should be acidified with an organic acid (mineral acids should not be used, as they may cause sugars present to caramelise and volatile products which reduce mercuric chloride), and submit to steam-distillation until about 1500 c.c. of distillate have been collected. When aldehydes are present, the vapours from the distillation must be passed, before entering the condenser, through a flask containing water and calcium carbonate; the formic acid is retained in this flask, whilst the aldehydes pass over into the distillate. Sulphur dioxide, if present, is removed by treating the neutralised and evaporated distillate with hydrogen peroxide and sodium hydroxide for four hours at the ordinary temperature; the excess of hydrogen peroxide is then destroyed by the addition of freshly prepared mercuric hydroxide. Salicylic acid yields an insoluble complex.

en heated with mercuric chloride in the presence of sodium acetate, the formation of this compound is prevented by the addition of sodium chloride. Generally, the amount of sodium chloride (1 gram per litre) contained in the mercuric chloride solution employed is sufficient for this purpose, but for the estimation of nic acid in foods containing large quantities of salicylic acid it is recommended that the neutralised distillate be concentrated, and that 1 gram of sodium chloride, 2 grams of sodium acetate, and 1 gram of mercuric chloride be added for each 50 c.c. of the concentrated distillate obtained.

W. P. S.

Estimation of Total Fatty Acids. P. SIMMICH (*Zeitsch. Nahr. ussm.*, 1911, 21, 38—44).—As incorrect results are obtained if fatty acids are dried in their free state before being weighed, the author recommends that, in the estimation of the total fatty acids in oils, fats, oils, and soaps, the fatty acids (liberated from the saponified fat in the usual way) should be separated by means of a mixture of ether and light petroleum; the ethereal solution is then neutralised by the addition of *N*/2-potassium hydroxide solution, and the solvent is evaporated in an atmosphere of hydrogen. The residue of soap is finally dried at a temperature of 100° under reduced pressure, and weighed. The weight of the fatty acids is found by subtracting, from the weight of the soap, 0·01907 gram for every c.c. of *N*/2-potassium hydroxide solution used for the neutralisation.

W. P. S.

Separation of the Liquid Fatty Acids (Unsaturated) from Solid Fatty Acids (Saturated) in Natural Mixtures of Fatty Acids. II. PIETRO FALCIOLA (*Gazzetta*, 1910, 40, ii, 425—435).

See this vol., i, 174.

Employment of the Electrometric Method for the Estimation of the Acidity of Tan Liquors. J. HENRY J. S. SAND and CLAUDIO J. LAW (*J. Soc. Chem. Ind.*, 1911, 30, 3—5).—The estimation of the acidity of tan liquors is rendered difficult by the dark colour of the liquors masking the colour change of the indicator used. The authors suggest the titration of the liquors by the electrometric method. The hydron concentration is determined in the usual manner by means of a hydrogen electrode, specially designed for convenient manipulation. It is convenient to use the normal calomel electrode as a standard, and the liquor which is being titrated is taken as neutral when the end-voltage is 0·69 volt. Experiments in which varying known quantities of acetic, lactic, or citric acids were added to tan liquors, and the acidity then measured by the above method, gave satisfactory results.

T. S. P.

Index of Oxidation of Milk. TEMISTOCLE JONA (*Gazzetta*, 1910, 40, ii, 414—418).—The index of oxidation of milk is the number of cubic centimetres of *N*/10-permanganate required to oxidise a given volume of it under certain conditions, and is constant unless the milk is watered or deprived of cream (Comanducci, *Proc. Sixth Congress of Applied Chem.*, 5, 606). In addition to the above index, the author

determines in a similar manner the index of oxidation of the whey obtained by treating the milk with acetic acid at the b. p. and subsequently filtering. By means of the double index so obtained it is possible to differentiate between watering and the separation of cream, for the former lowers the index for the whey only. The indices have been determined for the milk of two hundred cows of the Pavia district, as also the variations caused by definite admixtures of water or losses of cream, so that not only the nature but also the probable extent of frauds on milk practised in that city can be determined.

R. V. S.

New Method of Estimating the Lactose and Fat in Milk. TEMISTOCLE JONA (*Gazzetta*, 1910, 40, ii, 419—424. Compare preceding abstract).—The reduction of permanganate by milk is due solely to the fat and lactose contained in it. Hence, from the amounts of reduction effected by the milk and by the whey respectively, it is possible to estimate these two constituents. With genuine milk or milk merely deprived of cream, the results obtained are accurate; watered milk yields only approximate figures for the lactose if the water added contains substances which reduce permanganate, but the approximation suffices for many purposes. As the mean of his estimations, the author finds that 1 c.c. of $N/10$ permanganate is equivalent to 0.0049 gram of fat. Experiments with milks further show that 1 c.c. of $N/10$ permanganate is equivalent to 0.0014 gram of lactose hydrate, whilst from experiments with pure aqueous lactose solutions, the factor 0.001460 is obtained.

R. V. S.

Refractive Constants of Vegetable Oils. ISIDOR KLIMOW (*Zeitsch. angew. Chem.*, 1911, 24, 254—256).—The values of specific gravities, refractive indices, specific refractions ($n - 1/d$), saponification numbers, iodine numbers, and mean molecular refractions have been determined for different samples of the following oils: linseed, cotton, rape, hoof, hedge mustard, maize, olive, soja, sesame, and earth nut. The specific refraction appears to be independent of the iodine number and is practically constant, namely, 0.51. The mean molecular refraction varies with the saponification number. The molecular refraction of itself is of but little value, but is useful when compared with other constants. It is shown that determinations of specific gravity by the pyknometer or by the hydrometer do not affect the value of the molecular refraction to any large extent, and that even a few degrees difference in temperature at which the determinations are made has only a small effect on the final value.

J. J. S.

[**Detection of Ferricyanides.**] CARLO GASTALDI (*Gazzetta*, 1911, 40, 481—482).—See this vol., i, 185.

Assay of Cinchona Bark. Estimation of Quinine and Total Alkaloids. VIGNERON (*J. Pharm. Chim.*, 1911, [vii], 3, 103—105).—The methods described are simplifications of the processes described in the French Codex, and are recommended as affording results which are accurate enough for practical purposes.

the bark is extracted with 0·01% hydrochloric acid, and the extract concentrated, so that 100 c.c. contains the alkaloids of 20 grams of bark. An aliquot portion of this concentrated extract is precipitated by a definite quantity of a solution of ammonia and sodium oxide, previously saturated with (1) the total alkaloids of the bark under examination, and (2) quinine, by a special process.

The precipitated alkaloids are washed slightly, dried below 45°, dissolved in a mixture of ether and chloroform, and the residue from the solution dried and weighed as the "total alkaloids." For the estimation of quinine, the precipitate of total alkaloids is dried, then washed out with ether, dissolved in dilute sulphuric acid, and precipitated, dried, and weighed as the chromate. Full directions are given in the original as to the quantities of materials to be used and precautions to be adopted in carrying out the prescribed operations.

T. A. H.

Precipitation of Cocaine Solutions with Platinum Chloride. NYMANN and RICH. BJÖRKSTEN (*Pharm. Zentr.-h.*, 1911, 52, 71—74). A cocaine solution (about 20 c.c.) is acidified with 2 c.c. of hydrochloric acid (D 1·125), a sufficiency of platinum chloride is added, and three times the volume of alcohol. When fully deposited, the compound is collected on a weighed filter, washed with alcohol, dried at 105°, and weighed. As the salt is not absolutely insoluble, a correction will be made by adding 0·022 gram for each 100 c.c. of filtrate. The compound has the composition $(C_{17}H_{21}O_4N)_2H_2PtCl_6$. In the presence of atropine the method cannot be applied. Boric acid does not interfere to any extent, but in the presence of sodium chloride the precipitation is very incomplete.

L. DE K.

Saponin Reactions. C. REICHARD (*Pharm. Zentr.-h.*, 1910, 51, 1204).—A large number of tests are given, of which the following are the most characteristic.

Saponin nitroprusside in aqueous solution is at once reduced on adding saponin, when a flesh-coloured liquid is formed, which dries up as a dark green residue. This reaction neatly distinguishes saponin from alkaloids.

Diphenylamine Test.—Solid diphenylamine is moistened with a few drops of colourless 25% nitric acid, and a few drops of sulphuric acid added. The liquid is then divided into two parts, and to one of these is added a little saponin. After about half an hour, the reagent should still be colourless, or but very faintly green, whilst the saponin solution has assumed a beautiful yellow colour.

Titanic Acid Test.—Pure titanic acid is heated with sulphuric acid until the liquid does not adhere obstinately to the glass. If now the saponin is added, a violet coloration appears, but this soon disappears.

Mercur ammonium Chloride Test.—When a mixture of equal parts of the precipitate and saponin is moistened with water and allowed to stand nothing takes place, but if now the mass is moistened with mercur hydroxide, the edges turn yellow, then grey, and after a few hours the mass has completely blackened.

L. DE K.

Estimation of Tannin by means of Casein. MAXIMILIEN NIERENSTEIN (*Chem. Zeit.*, 1911, 35, 31).—Fat-free casein may be employed in place of hide-powder for removing tannin from solutions containing the latter, together with gallic acid and sugars. One hundred c.c. of the solution are shaken for ten minutes with six grams of casein, a further quantity of three grams of casein is added, the mixture is filtered. The estimation is then proceeded with the usual way. W. P.

The Degree of Accuracy with which Proteins can be Estimated in Milk by Formaldehyde Titration. H. DE RICHMOND (*Analyst*, 1911, 36, 9–11).—The author has applied his process to a number of samples of fresh milk with the object of ascertaining the agreement between duplicate estimations and the constancy of the factor for calculating the proteins from the aldehyde figure obtained. As mentioned previously (Abstr., 1906, ii, 6) strontium hydroxide is preferred for use in the titration owing to the fact that when this substance is used, the acidity of formaldehyde does not increase with dilution. The method employed is as follows: 10 c.c. of the milk are added 1 c.c. of a 0·5% phenolphthalein solution and the milk is neutralised with $N/11$ -strontium hydroxide solution. 2 c.c. of a 40% formaldehyde solution are then added, and the titration is continued until a pink coloration is obtained. After deducting the acidity of the formaldehyde solution, the latter titration represents the aldehyde figure. The proteins were also estimated by Kjeldahl's method, using the factor 6·38 to convert the nitrogen found into protein. From the results obtained, the factor 0·170 is calculated to give the most probable figure to express the relation between the protein and the aldehyde figure. The difference between the amount of proteins found by the aldehyde method and by the Kjeldahl method varied from +0·20 to -0·13%. W. P.

Micro-chemical Detection of Albumin. THOMAS BOYD (*Chem. Zeit.*, 1911, 35, 69–70).—The true albumin in proteins may be coagulated and recognised under the microscope by immersing them for half an hour in a solution containing 8% of acetic acid, 1% sodium chloride, and 0·5% of caffeine. L. DE

The Estimation of the Enzymatic Activity of Nucleases by the Optical Method. GIACOMO PICHINI (*Zeitsch. physiol.*, 1910, 70, 85–93).—The activity of nucleases in blood serum may be investigated, not only by estimating various tissue extracts may be investigated, not only by estimating the cleavage products chemically, but also by the polarimeter; the nuclease is dextrorotatory; as it is broken up into its cleavage products power disappears, and the rate of fall in the dextrorotation measures the activity of the nuclease. The present research deals only with the nuclease of blood serum. W. D.

